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A TREATISE

ON

MASTING SHIPS

AND

MAST MAKING;

EXPLAINING THEIR PRINCIPLES AND PRACTICAL OPERATIONS,
THE MODE OF FORMING AND COMBINING MADE-MASTS,
ETC., ETC., ETC.

ORIGINALLY DESIGNED FOR THE USE OF THE STUDENTS IN THE LATE ROYAL NAVAL
COLLEGE, AND SCHOOL OF NAVAL ARCHITECTURE.

BY JOHN FINCHAM,

MASTER SHIPWRIGHT OF HER MAJESTY'S DOCKYARD, CHATHAM, AND LATE SUPERINTENDENT OF THE SCHOOL OF NAVAL ARCHITECTURE.

SECOND EDITION, CONSIDERABLY ENLARGED,
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ADVERTISEMENT TO THE FIRST EDITION.

At the end of the first Edition of his "Outline of Ship Building," the Author introduced a short course of Mast-making, for the use of the students of the Royal Naval College, and of the School of Naval Architecture. But when it was found that the usefulness of this addition exceeded what he expected, it appeared desirable to enlarge it considerably, and arrange the subjects of which it particularly treated, under distinct heads; the result was, that the part thus altered exceeded the prescribed limits of the original work: he has therefore been induced to print it separately.

This course of Mast-making is intended principally for the students of the School of Naval Architecture; but as the students of the Royal Naval College likewise receive instruction, partially, on the subjects treated of in these pages, it is to be hoped it may not be found inapplicable for their use. It is also arranged with a view to afford some information to naval officers, and particularly to carpenters in the Navy, who frequently find great difficulty in obtaining the information it contains in all the branches of Mast-making; and to whom, especially when they are on foreign stations, a thorough knowledge of this subject is of the first importance.

As we have no treatise at present in our language at all applicable to the present state of the art of Mast-making, and as it is now more than thirty-five years since any work has been published on this subject, it may be unnecessary to offer any remarks on the propriety of this attempt to supply the deficiency; and it is to be presumed that, if the changes which have taken place in the practical operations of Mast-making are not sufficient to establish the utility of this undertaking, the omission from every work in English, of the principles on which the masting of ships depends, is a sufficient vindication of the present effort.

In the first part of this work, a few general principles relating to the centre of effort are familiarly stated, so that the power and disposition of the sails, with a method of finding their proportions, may be determined; and hence the masts and yards likewise determined. Some general observations are likewise introduced on the lee-way, and on the proper angle for bracing the yards, &c.

In the second part, proportions are given for masts, yards, &c., from the smallest vessel, to a first-rate; the whole of them are taken from vessels and ships that have been found to answer well, as it respects their having the proper quantity of sail, and of its being judiciously balanced.

In the third part, the proportions are given for the principal and smaller diameters of masts and yards, &c.; some little difference is made from those commonly adopted, according to the observations the Author has made on masts and yards that have been found weak.

In the fourth part, a general account is given of masting-timber, its qualities, relative strength, classification, and the manner of converting and preserving it.

Finally, the different modes of forming and combining the several masts, yards, &c., are explained, with the rules observed in fixing the furniture connected with them, and the sizes of the fastenings, with all the practical operations necessary to be known by the mast-maker; and the Work concludes with some remarks on surveying masts, determining the nature and extent of defects, and forming temporary yards, &c., at sea.

The masting of merchant-vessels has been entirely omitted; but it is intended shortly to give, in an Appendix, an outline of masting the merchant navy, with a few observations on forming and combining made-masts, in addition to those already given.

The detail given of the practical execution of the different branches of Mast-making, and many of the tables, may be considered by some as unnecessarily diffuse; but as it is only through an accumulation of facts and observations, that the practical man is enabled to pursue his avocations; and as it is from well established facts, that scientific investigations are pursued with certainty, the Author has been induced to extend the detail, and to arrange, under the different branches, what he had obtained by experience and long observation. He hopes that this may render the Work more generally useful, especially as he has avoided all difficult *formulæ*, which, to the practical man, would be of little use; and to those who have the advantage of applying science to their practice, these facts are still of the greatest consequence.

In the present limited state of our knowledge of the effects of the combined agency of wind and water, constructors must be left in a great degree of uncertainty, as to the proper dispositions of the sails with relation to the body; and their success must greatly depend on the extent and accuracy of the examples they have of ships that have been properly masted. All that has hitherto been done to ascertain the proper place for the centre of effort of the sails, has been of little use,—no principles being yet known that can be easily applied; to determine this point, the constructor must be left in a great measure to the exercise of his own judgment, and to a comparison of the effects produced by the position of the sails, with relation to those elements of the body that are known to influence it most under sail; for which purpose, the Author has given, in the introduction, short tables containing elements of bodies of different ships, with their centres of effort of sail, for the purpose of comparison.

The observations in the introduction on the moment of sail, compared with the moment of stability, and on the proportion necessary to be observed between the fore and after sails, to ensure the proper working of the ship, may be useful for making comparisons; for, when the quantities are correctly obtained (and this can be done with the greatest facility), no error of importance need take place in giving the proper power and disposition of sail.

As many of the rules given by different authors for determining the correct proportions of masts, yards, &c., involve in them the roots of powers which it would be difficult for the common reader to apply, a rule is introduced, in which the simple terms of length and breadth only are used, which will be found sufficiently accurate, especially as most rules only approximate to the proper quantity; and as by this rule the surface of sail is first determined, we not only get the sails in proportion to each other, according to what experience has pointed out as best, but the labour is considerably reduced, when the quantity and position first determined, require alteration.

The observations made, and rules given, respecting the bracing of the yards, though more immediately connected with seamanship, may yet not be considered out of place in this work, as introducing to the student a subject, the knowledge of which is necessary, not only to the seaman, but to the shipwright; since, without a due attention to it, the best results attainable from the proper disposition of the masts and well-proportioning of the sails can never be certainly ensured.

The position and rake of masts are given as taken from different ships in the examples that have been selected; as, to determine their position correctly, it is requisite to have the relative quantity of sail on the different masts, since it is the moment of the fore and after sails that produces the proper effect; the raking of masts is given with their position and the place of the centre of effort of the sails, as found in the same examples, and not as that which it is considered would produce the best effects. For, with the centre of effort of the sails, and fore and after moments correct, the whole of the masts should rake, so that when the ship is inclined to her most common angle, the plane of the sails should be perpendicular to the longitudinal axis of the ship, or else part of the force of the wind that acts on the sails must depress the ship. And though experience may in some cases appear to prove the contrary, when, by bringing either of the masts more upright, the properties of the ship have been improved; yet the effects produced may be attributed, not to the alteration of the rakes, but to that of the position of the centre of effort of the sails, or of the fore and after moments. For a further illustration of which, see "Papers on Naval Architecture," conducted by Morgan and Creuze, Arts. 7, 22, 33, 41; and 47, Vol. I.; and Arts. 27 and 29, Vol. II.; in reference to which, I have much pleasure in acknowledging the use I have made of several articles in these Papers; and likewise to the Translation of Chapman's "Architectura NavalisMercatoria," with notes by Professor J. Inman, D.D.

SCHOOL OF NAVAL ARCHITECTURE,
July, 1829.

ADVERTISEMENT TO THE SECOND EDITION.

The first Edition of the following Treatise on Masting Ships and Mast-making having been some time out of print, and repeated applications having since been made for the work, the Author has been induced to publish a Second Edition.

The engagement made in the former edition, with regard to the Masting of Merchant-vessels, has been fulfilled in the present; and several new methods have been described of combining made-masts· There has likewise been given a description of the Masting of Steam-vessels, with the proportions of the masts, yards, &c. There has also been added, a plan for the systematic Classification of Masts, in which it is shown that a few systems of masts and yards would be sufficient for general use, so as to bring the power of the sail in a correct relation to the stability of the ship.

It was long considered desirable to have some systematic classification of masts and sails, and the difficulty has in a great degree been removed, by the classification introduced into the British Navy. In an "Elementary Essay on the Principles of Masting Ships," published, in June 1834, by Mr. Henry Chatfield, member of the School of Naval Architecture, it was proposed to substitute a graduated scale of masts and yards, distinguishable simply by progressive *numbers*, for the existing practice of forming them into sets, or *classes*. The object of that proposition, in addition to the practical facilities contemplated, was, to enable a naval architect to select, at any time, from among the graduated sizes, such as would be adapted to the ships to which he might require to apply them.

The present Work has likewise been enlarged and improved, by the addition of rules for determining more accurately the position of the centre of effort of the sails. In forming many of the rules which have been introduced into this Work, a difficulty has been experienced, arising from the want of accurate knowledge of the combined effects of the wind on the sails, and the resistance the body meets in passing through the fluid. In the absence, therefore, of the data required for determining with certainty the relation of the two forces, it became necessary to estimate the effects which have been produced on a number of ships; and to compare those effects with other elements which can be correctly estimated. By repeated trials, also, it has been attempted to ascertain the limits within which any of the elements may fall without producing bad effects, or within which ships have been found to answer well. Thus by investigation and comparison it has been attempted to supply rules relating to those branches to which mathematical investigation has not yet been successfully applied. In these efforts the Author trusts he has been so far successful, that the results at which he has arrived will enable the constructor to ensure such a disposition of sail, that a ship masted in accordance therewith will answer well in performing all the evolutions that may be required for properly working and sailing her, notwithstanding the present deficiency of theoretical knowledge.

To the practical operations of making masts, the Author has paid all the attention which the importance of the subject appeared to require, with a view to bring into use the different trees which the store may at any time furnish. This point has been attentively considered, as there is often found a great difficulty in obtaining sticks of large dimensions.

The Author trusts these additions will be found to render the Work more useful; and that in the alterations which have been made, due attention has been paid both to facility in the obtaining, and to economy in the appropriation of timber. Instead of the small Plates which were published with the First Edition, four folio Plates accompany the present edition, in which several new figures have been introduced.

CHATHAM DOCKYARD,
May, 1843.

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INTRODUCTION TO

MASTING OF SHIPS.

GENERAL DEFINITIONS.

1. The various methods of supporting and extending the sails, are regulated according to the class of the vessel, and the disposition of the sails; these are distinguished according to their position in relation to the vessel, or to each other: when there is but one mast, it is simply called the mast; when there are two, they are commonly denominated the main and fore-masts; and when three, the main, fore, and mizen-masts. The mast which is nearest to the bow or head, is called the fore-mast; that next abaft the fore-mast, or nearest the middle of the ship, the main-mast; and the third, or that nearest the stern, the mizen-mast.

2. In small vessels, boats, &c., there is frequently but one mast, and when there are more than one, they are only such as are attached to the hull; with a single piece called a yard or boom for spreading the sails. In larger vessels there is one support or mast above the lower; and in other vessels of a more complicated rig, there are two or three above each other; with corresponding yards and booms.

3. The masts attached to the hull are called the lower or standing masts; the next above, the top-masts; the next above these, the top-gallant-masts; and sometimes there is one above the top-gallant-masts, called the royal-mast.

4. The different parts of a mast are distinguished by the names of the body, the hound, and the head: from the lower end to the place where the rigging stops, is called the hounding, and from thence to the upper end, or that part which is over-lapped by the mast above, is called the heading, while the part from the uppermost deck is called the housing. The portion of the mast from the lower part of the heading to the termination of the projecting wood, left for the purpose of strength, and for supporting the mast above, is called the hounds; the upper or projecting part of the hounds is called the stops; and the space from the lower part of the hounds to the heel, is called the body of the mast. The parts above the head of the top-gallant-masts, when they are not separate, or, as it is termed,

with fidded royal-masts, are called the poles; the lower one is called the royal-pole, and the upper, the signal or sky-sail-pole.

5. The yards are either square or lateen; they are denominated *square* when placed nearly at right angles with the mast, and *lateen* when oblique. They are named according to their situations; those which are placed on the main and fore-standing-masts are called the main and fore-lower-yards, that on the mizen is called the cross-jack-yard. The yards on the top-masts are called the top-sail, those on the top-gallant-mast the top-gallant, and those on the royal-mast the royal-yards. Yards have two parts, the slings and the arms. *Square* yards have the slings always at the middle; *lateen* yards, at a certain proportion of the length from the middle. The yard-arms are at the extremities of the yards, or that part without the sail or cleat.

6. The principal means of extending the sails beyond the extremities of the ship, are the *bowsprit*, which is attached to the hull, projecting forward from the bow or fore part of the ship, for supporting the fore-mast, and extending certain head-sails; and the *main* or *driver-boom* and the *gaff*, which are used for extending the after-sails. The bowsprit supports booms, which are used for the purpose of extending the sails still further forward, called the jib and flying-jib-booms; besides which there is a yard called the sprit-sail-yard, for staying the jib-boom, and for carrying a sail; and sometimes there is another called the sprit-sail top-sail-yard.

7. The lower of the two booms, for extending the after lower sail in brigs, schooners, and cutters, is called the main boom; when it is attached to the mizen-mast, it is denominated the driver boom; the upper one in all vessels is called the gaff.

8. There are booms likewise for extending the sails beyond the yards, one attached to each arm of the main and fore-top-sail yards, called the top-gallant studding-sail-boom, and another to each arm of the main and fore lower yards, called the top studding-sail-boom; sometimes there is one fixed to each side of the ship, for the lower studding-sails, called the lower studding-sail or swing-boom.

GENERAL OBSERVATIONS. (*Plate* I.)

9. THE first discoveries for impelling vessels by sails with the wind in different directions, were made, we can easily conceive, by those who would adopt the least complicated form, that of a single square sail erected on a single mast. (Figs. 1 and 2.) To the quadrangular we find added,

at a very early period, the triangular sails. (Figs. 3, 4, 5, 6, 7, and 8.) These have continued to constitute the forms of all sails up to the present time; and, according to the writers on the ancient navies, we find single sails of these forms were used, at very early periods, by the Egyptians, Carthaginians, and Greeks.*

10. The ancients, as they increased the size of their vessels, found it necessary to give them more than one sail; this we find was the case in the vessels which composed the fleets built by Ptolemy Philadelphus, and Hiero the Second, and also those which were sent against Syracuse, when besieged by Marcellus, for they had three and even four masts. (Figs. 7 and 8.)

11. According to Hesychius, Isidorus, and Suidas, these masts were thus denominated; the main-mast Acation (fig. 9), the mast placed at the poop, (which was second in size,) Epidron (fig. 11), that placed at the prow Dolon (fig. 10), and the fourth, which was made use of in some of the largest vessels, according to Silius Italicus, Artimon (fig. 12); a name still preserved by the French as their mizen.

12. The sail which was situated on the Acation was in the form of a triangle, with its vertex downwards, the upper part of which was placed horizontally; above this sail, and fixed to the same yard, was the *sapparum* (figs. 8 and 13), a sail of similar form, with its vertex upwards. The sapparum, according to some authors, was only hoisted as a signal of victory; but it appears to have been a sail too well disposed, and of too great an extent, not to have been used in navigating their vessels.

13. The sails affixed to the Dolon, Epidron, and Artimon, were likewise of a triangular form, but with their yards more or less elevated at the after-end, and their fore-ends brought to the deck, while they were slung or fixed to the masts near the middle. From these sails, it is most likely the lateen sails (figs. 14 and 15), were derived, since they bear so near a resemblance, and especially as the Romans, in imitation of whom we use them, obtained all their maritime knowledge from the Carthaginians, Egyptians, and other ancient nations. (Plate I.)

14. From the lateen sails, were derived most of those of a triangular form; for as vessels increased in size, and required a greater surface of canvas to impel them, it became necessary to give to the mast a greater support. With this increased support the lateen sails could not be so effectually used, which no doubt gave rise to the raking of the masts with Bermuda sails

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* Single sails were commonly called by the Greeks *Istia*, but sometimes *Fassones* or *Armenia*. The Carthaginians on their *Exeres* and *Epleres* appear to have formed a system of sails, supported by three masts. *La Marine des Anciens Peuples*, Chap I. and II., par. M. Le Roy.

(fig. 16), to the various modifications which have taken place from time to time, and to the various methods which have been introduced of combining with them those of a quadrangular form; whilst, by varying the number and disposition of these two kinds of sails, we are enabled to form numerous varieties, to be used according to the idea of the navigators, the services of the vessels, the places in which they are employed, and the number of men that are to navigate them.

15. In every system, whatever may be the number or shape of the sails, the same rules are observed for placing the whole in the same position in relation to the body of the vessel; that the continued efforts of the sails may act according to the resultant of the force of the water on the body when in motion, and that, when trimmed, they may destroy, as little as possible, the effect of the wind on each other.

16. The whole effort of the wind upon the sails must not exert such an influence on the body as to give it too great a tendency, with a side wind,* to come to the wind, or to fall off from the wind, or to cause the fore or after part of the ship to be depressed when sailing in the direction of the wind, or nearly so.† To prevent the sails from producing these effects on the vessel, they must be so situated, that, were the whole effort of the wind collected in one point, *as to height*, a horizontal line passing through it, would likewise pass through the point of intersection of lines drawn from, and in the directions of, the resultants of the vertical and direct forces of the water on the fore and after bodies of the ship; and *as to length*, in a vertical line drawn through the point of intersection of the mean directions of the lateral and direct resistances of the water on the body.

17. The point of sail or place in which the whole effort of the wind is supposed to be collected, is commonly called the centre of effort of the sails; and is the point in which, if a single force was applied equally, and directly opposed to the force of the wind, it would destroy its effect or produce the same result as when uniformly distributed; or as if in this point, the centre of a single sail was placed with a surface equal to the sum of the surfaces of all the sails. It is found in a manner similar to that by which we find the common centre of gravity of several bodies, only that we in this case consider the surface in place of the weight or magnitude of the body. (See Wood's Mechanics, page 122, art. 172.)

18. Before the centre of effort of the sails can be obtained, it is necessary to make a plan of the sails (fig. 1, plate II.), and find the centre of gravity of each sail to obtain the moments.

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* Commonly termed, by seamen, on a wind, or by the wind.

† Termed, by seamen, sailing free, or before the wind.

19. The sails that are in general placed in the plan of the sails, are those which are most frequently used; in square-rigged vessels, the fore and main courses, fore, main, and mizen-top-sails, fore, main and mizen-top-gallant-sails, driver, jib, and sometimes fore-top-mast stay-sail; and in fore-and-aft rigged vessels, as cutters, the main-sail, fore-sail, and jib.* The whole of these sails may not always be set; nor is the pressure of the wind, when it acts obliquely, and as the sail becomes more pressed, the same on both leeches; but since we obtain the moment of the sails, with a view only to compare with ships in which the quantity of sail is well proportioned to the stability, and in which the position of the point of sail is correct as to length, the unequal effect of the wind, and the number of the sails used, (and these the principal sails,) being the same in each case, will not affect the comparison.

20. If sails were rectangular, the centre of gravity of each would evidently be in the point where its diagonals intersect each other. But since most sails are either trapeziums or triangles, their centres of gravity must be found differently. If two sides of a triangular sail, as the jib, be bisected, and lines drawn from these points to the opposite angles, the intersection of the two lines will be the centre of gravity. The sails that are trapeziums with two equal sides, as the top-sails, are formed into two triangles, *g q z* and *g q v*, by drawing the diagonal *g q;* the centre of gravity of each triangle is found, as for the jib; a line, *b a*, is drawn through the two centres of gravity, and the point in which it cuts the middle line of the sail *c*, is its centre of gravity.

21. When the sail is a trapezium, as the driver, not having two equal surfaces on each side of the middle, it is first divided into two triangles, *a z d* and *a z g*, by drawing the diagonal *a z;* the centres of gravity are found as before, and a line, *h l*, is drawn to pass through them; this figure is then formed again into the two triangles *d g a*, and *d g z*, by drawing the diagonal *d g*, from the two other angles *d* and *g*, the centre of gravity of these is found, and a line, *o f*, drawn to pass through them; the intersection *m*, of the two lines *o f* and *h l*, is the centre of gravity of the sail.

22. The areas of all the sails that are triangular, are found by multiplying the base by half the height, as in obtaining the area of a common triangle; and the area of a trapezium, by forming it into two triangles, obtaining the area of each, and taking the sum of the two. The moment, as to height, is obtained by multiplying the height of the centre of each sail into the area; the sum of the moments of all the sails, divided by the sum of

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* The second or third jib is commonly taken, as it is seldom that the first jib is set on a wind.

26. The centre of the effort of the sails, as to length, requires to be more or less forward, (before the common centre of gravity of the ship,) according as the ship is less or more full forward, compared with the fulness of the body aft; and likewise according as she is less or more by the stern. Those ships that are cleanest at the foremost extremity, and the least by the stern, will require the masts the furthest forward. It is therefore desirable for ships that are sharp at the foremost extremity, to have a greater difference of draught of water; with the excess aft, to avoid, when the centre of effort is in its right position, having the masts further forward, than the position in which the pressure of the water on the body can afford adequate support.

27. When the vessel is sailing with the wind before the beam, the direction of the motion of the body will not be directly in a line with the keel, but in a course deviating from it according to the lee-way. (See article 96.) This will produce a lateral as well as a direct resistance on the body, and the resultant of the forces that act on the bottom will determine the place of the point of sail, with respect to length; and if that be not placed in its true situation, the force of the rudder will be required to keep the ship in the proper course. If, when sailing by the wind, the rudder is required to maintain the equilibrium, the helm should be kept a-weather, and never a-lee, since experience has proved that, with a lee-helm, a ship is seldom weatherly.

28. If the rudder be carried over to the lee side, or the helm a-weather, a force acts upon it to carry the stern to windward; and the resultant of the direct and lateral resistances of the water on the bottom, passing before the resultant of the force of the wind on the sails, has a tendency at the same time to carry the bow to windward, by which forces the body is kept more to windward, without taking into the account, that a greater effect is produced on the rudder, when the helm is a-weather, by the lee-way the ship makes; while, if the rudder is required to be kept on the weather side, or the helm a-lee, to maintain the equilibrium, part of the force on the rudder is acting with the wind on the sails; the resultant of which then passes before the resultant of the force of the direct and lateral resistance of the water on the bottom, and consequently must produce an effect to carry the body to lee-ward, and increase the angle of lee-way. Likewise, when it is required to keep the helm a-weather, the helmsman has less difficulty in keeping the ship by the wind, and the sails with their proper degree of fulness.

29. To obtain correctly the place for the centre of effort of the sails, when the ship is on a wind, is impracticable, from the imperfect know-

ledge we have of the action of fluids on bodies in motion. To determine this point, the place of the mean direction of the water must be found by means of the direct and lateral resistances; but as it is known that the particles of fluids do not act with the same effect under every circumstance, when they impinge on a body, but strike or act with more or less force on different parts, from causes that we are little acquainted with in the present state of the science with which this subject is connected, constructors are left, in determining this point, as in determining the height, to rely mainly on their own judgment, or to make comparisons with the forms of different bodies, and the positions of the sails of ships that have had their sails properly adjusted.

30. To find the resultant of the direct and lateral resistances on the body, a number of horizontal and vertical sections must be formed, when the vessel is inclined; the latter cutting the body at right angles to the line of lee-way. To determine this resultant, with a view to obtain the place of the point of sail, as to length, will be seen, by a reference to an example given in the Translation before referred to (Chap. X.), not only to be attended with a considerable degree of uncertainty, through our imperfect knowledge of the action of fluids, and in fixing the proper angle of the lee-way; but to be attended also with considerable trouble, in consequence of the extent of the calculations required.

31. From the uncertainty there is in the application of any rule founded altogether on scientific investigation, we are left to the experience obtained from ships that have their sails properly balanced, to form some practical rule, deduced from a comparison of the effects produced by a variation of those elements in the constructions that are known to have the greatest influence on the body, when it is acted on by the united efforts of the water on the bottom, and the wind on the sails; and one that can be calculated with certainty, and without much difficulty.

32. No simple elements affect the resultant of the water more than the position of the centre of gravity of the vertical and longitudinal section, and the positions of the centres of gravity of the fore and after bodies in relation to the common centre of gravity of the vessel; but as these elements have seldom been obtained for any purpose in the construction of the body, Tables have been made, from ships that have answered well; and from them a rule has been formed, to approximate sufficiently near for all practical purposes.

33. If the bodies of ships below water were solids generated by curves, varying according to known laws, or had always the property of some

regular solid, the influence of the adhesion of the fluid, and the point of the resultant of the water, might be more easily discovered; and this, if obtained for one solid, would be relatively the same for all similar solids, and would require the centre of effort of the sails to be always in relation to some point on the body; but in the varied forms of ships, this cannot be the case, and this point will require to be nearer one or other of the extremities, according as they are relatively full forward or clean aft; or, according to the excess of the draught of water aft, the fuller the bow and the more the ship is by the stern, will this point approach the stern; or, as the ship is sharp forward and full aft, or becomes nearer on an even keel, will it approach the bow.*

34. It is evident that the body cannot become relatively full at either extremity, without influencing the centre of gravity of displacement; nor can it have an excess of draught of water aft, which will be materially affected by the centre of gravity of the vertical longitudinal section, without the resultant of the water passing aft. We may, therefore, by comparing the effects produced by an alteration of these elements in different ships, while we have the situation of the centre of sail fixed, discover the degrees of influence they have on the body; and by them form a rule, that, while it may not be strictly correct, may yet fall within the limits in which the centre of sail varies, in ships that are considered to have their sails properly balanced.

That constructors may form a comparison when determining the place of the centre of effort, from the elements before alluded to, the following Table of results is given, as obtained from ships that vary the most in form and draught of water, while they were found to carry a proper helm, and to work well. It is from the results given in the following Table, that an example for placing the position of the centre of effort may be derived, as is here given; not as being strictly correct, but as sufficiently near for all practical purposes, and as nearly as it can be obtained, in the absence of a more correct knowledge of the laws of resistance on floating bodies.

From the observations that have been made respecting the influence of the centre of gravity of displacement, and that of the centre of gravity of the longitudinal vertical section, it will be seen that as the former goes forward, and the latter aft, or as they approach each other, so will the centre of effort of the sails, in degrees, require to be carried aft; and that, accordingly as these elements respectively influence the mean resultant of the water; the following Rule will always give the place of the centre of effort of sails, for the ship to answer well; and though it will not agree, in all cases, with the Table in which the several results are given, yet it will fall within the limits in which ships are found to answer, and will vary with the elements that most affect the mean resultant, as will be seen by the Rule.

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* In the Papers on Naval Architecture, Art. 33, Vol. 1, and Art. 11, Vol. 2, some ingenious observations on the position of the centre of effort of the wind on the sails, in relation to the length of the vessel, are given by Lieutenant A. G. Carlsund, of the Swedish Royal Naval Engineers; and in Art. 41, Vol. 1, in the same Papers, some observations on the same subject, in reference to Art. 33, by Mr. William Henwood, late Student of the School of Naval Architecture.

RULE.

Add $\frac{3}{4}$ of the distance that the centre of gravity of the vertical longitudinal section is abaft the middle of the water-line, to $\frac{2}{3}$ of the distance that the centre of gravity of displacement is before the said middle; by the sum of which, divide the distance that the centre of gravity of displacement, and centre of gravity of the vertical longitudinal section, are apart; the result will give a divisor, for dividing $\frac{1}{10}$ the length of the load-water line, taken from the fore part of the stem to the after part of the stern-post; this last result will give the distance nearly what the centre of effort of the sails should be before the centre of gravity of the vertical longitudinal section. In cutters and vessels with the fore and aft rigging, the effect of the sails is different, and will require an alteration in the Rule: in which case, $\frac{1}{10}$ the length of the water-line should be divided by the distance between the centre of gravity of displacement and centre of gravity of the vertical longitudinal section, for the distance that the centre of effort is before the latter centre.

EXAMPLE.

First Column—Three-Deck Ships.

Length of the water-line 211. $\frac{211}{10} = 21.$

Centre of gravity of displacement before the middle, 3 feet.

Centre of gravity of vertical longitudinal section, abaft the middle. . . . . 4.7 feet.

$\frac{2}{3}$ of $3 = 2$. $\frac{3}{4}$ of $4.7 = 3.5$. $3.5 + 2 = 5.5$.

$\frac{3 + 4.7}{5.5} = 1.4$. $\frac{21}{1.4} = 15 =$ what the centre of effort of the sails should be before the centre of gravity of the vertical longitudinal section, according to the Rule; $4.7 + 10.2 = 14.9 =$ what the centre of effort should be, according to the Table, giving an error of 1 foot.

ELEMENTS.	THREE-DECK SHIPS.		TWO-DECK SHIPS.			RAZEE.	FRIGATES.					CORVETTES.			BRIGS.			CUTTER.	YACHTS.						SWEDISH SHIPS.			MERCHANT SHIPS.		
																			Ship.	Brig.	Schooner.	Cutter.	Cutter	Cutter.	Two-Deck Ships.	Corvettes.	Brig.	Ship.	Ship.	Brig.
	feet.	feet.	feet.	feet.	feet	feet.	feet	feet.	feet.	feet.	feet	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet	feet.	feet.	feet.	feet.	feet.		
Length on the water-line	211.0	206.7	190.25	194.0	177.9	178.5	162.0	161.3	141.7	122.5	115.9	122.5	110.0	107.7	97.6	90.5	87.7	65.6	102.8	76.2	83.0	65.3	57.8	57.0	177.0	107.0	97.2	165.0	124.75	76.0
Difference of draught of water. Excess forward																														
Difference of draught of water. Excess aft ..	1.0 to 1.6	1.0 to 1.3	1.0	1.0 to 2.6	1.8 to 2.5	0.	1.5	.8	.8	.3	.9	1.2	.75	.8	3.75	4.3	.9	5.9	1.1	.8	2.6	3.6	4.8	2.3	.9	.97	2.92	0.0	0.0	0.0
Distance of the centre of gravity of displacement from the middle of the water-line	3.0	2.4	1.85	2.7	2.2	3.1	1.35	2.0	1.95	3.1	1.8	1.8	2.2	1.95	1.5	.4	1.0	abaft 1.35	1.7	2.0	0.0	Abaft 1.7	2.0	1.2	2.92	2.34	2.0	2.1	1.8	1.5
Distance of the centre of gravity of vertical longitudinal section from the middle of the water-line	4.7	4.9	4.9	3.8	3.6	3.5	2.5	2.6	2.4	2.7	2.3	3.6	3.0	3.1	4.0	4.3	1.5	4.4	2.0	1.0	2.8	4.4	5.0	2.4	3.7	3.0	3.4	3.0	3.0	1.6
Distance of the centre of effort from the middle of the water-line	10.4	10.0	9.3	10.0	9.5	8.7	9.0	9.2	7.0	5.9	6.0	5.0	4.14	5.24	3.0	2.8	4.4	abaft 2.2	5.0	4.06	Abaft. 3.0	2.2	1.9	4.0	8.6	4.56	3.4	8.3	5.6	3.6

35. By attending to the position of the centre of effort of the sails, we may, by modifying their arrangement, if necessary, succeed in balancing the ship on a wind; but to produce such a disposition of the sails as may conduce to facilitate the working of the ship, there must be a correct relation between the moment of sail before and abaft the centre of gravity of the ship or axis of rotation, which may not be the case, though the ship may be properly balanced when by the wind.

36. When the ship is in stays, a certain and reciprocal effect should be produced by the sails forward and aft, as the quality of working depends, in a great measure, on properly proportioning the fore and after sails. If the moment of sail be too powerful forward, and the sails be not worked quickly, the mean resultant of the water will pass to the lee quarter, the ship will fall off before she has recovered her way through the water, and considerable time will be lost before she can be brought by the wind; or, if not powerful enough, the ship will not pay off, but remain head to wind, and get stern way. If, on the contrary, the after movement be too powerful, the ship may come to before head-way is obtained, and the head sails are brought to act. These inconveniences in working the ship may be prevented, to a certain extent, when there is not too great an influence produced by the excess of either of the moments, by an attention to the trim of the ship and to the bracing of the yards. This however must not be depended on, since, to produce this, the ship may be brought out of her proper trim, and may be made uneasy; but we must attain, as near as possible, the correct proportions, by an attentive comparison of the fore and after moments of ships that work well, with other elements upon which the placing of the sails depends.

37. The relation which the fore and after moments should bear to each other, can be determined only by examining their relation in a number of ships. In a ship that had a strong tendency to come to in stays, the fore moment, from the middle of the length on the water-line,* was found to the after moment as 1 : .84; while, in a ship that was found to fall off in stays, the fore moment was to the after moment as 1 : .66. The comparative moments of several other ships that were found to work well, according to the reports given by experienced officers on board of them, varied from 1 : .72 to 1 : .77.

It would appear, therefore, according to the experience we have obtained by the working of good ships, that the relation of the moments should be somewhere between the two limits; and, having determined this, which may be done with more certainty by examining the moments of a greater number of ships, any little disposition to come to, or fall off, may always be corrected by an attention to the trim, and that without affecting any other quality of the ship.*

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* The middle of the length of the water-line is taken, not as the exact point in which these moments should be brought in relation to each other; but as being more easily determined, and as falling within the limits that bring them sufficiently near for all practical purposes.

38. The proportion for masts and yards, as derived from the simple terms of length and breadth, will be found under the examples given for each kind of rig; but it would appear desirable that the sails should vary according to the form of the body, as to their relative tautness or squareness. This should be determined according to the comparative degree of influence of the direct and vertical resistances; but as there are many circumstances that would cause uncertainty here, as before stated, in determining the place of the centre of effort, as to length, constructors are usually guided by a comparison of those elements that are easily obtained, and that most affect the direct and lateral resistances, by observing in what degrees they varied in proportion to the height of sail. It is of great importance to have a correct knowledge of the adjustment of these elements, and of the principles on which these adjustments depend, that the person managing the vessel may be able to take advantage of every circumstance.

39. For determining the height of the sail, the area of the load-water section, and the depth of the centre of gravity of displacement, are the elements the most proper to be compared together, as both the direct and vertical resistances are chiefly affected by them; and the following Rule will give very nearly the truth, as it regards the proper height of the centre of effort.

RULE.

Divide $\frac{8}{10}$ of the area of the load-water line, by the depth of the centre of gravity.

The breadth must also be taken into account, as most affecting the stability.

The breadth of the sails must be compared with the same elements, as it should be in the inverse proportion of their height, provided the length of the ship will admit of it; as upon this element the spread of the sail must greatly depend.

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* See Papers on Naval Architecture, Art. 47, Vol. I.

40. To facilitate the comparison of the different elements of the body with the height of sail, the following Table of Results is given. They are obtained from the same ships as those given in a preceding Table.* (34.)

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* The designs for the sails of the Swedish ships, as taken for examples, were made by Colonel Borneman of the Swedish Royal Naval Engineers. To the brig and corvette, the sails were applied to bodies of his own construction; but the sails of the 80-gun ships were applied to the Carl XIII., one of Chapman's construction; and the Author has been informed, were found to answer extremely well. In the design, the greatest credit is due to the projector, not only for the nicety of adjustment, which will appear in the results of the calculations the Author has made on them, and given in the Tables of Proportions, but also for the beauty and symmetry in the form of the sails.

the areas, gives the height of the centre of effort. (17.) To obtain the distance of the centre of effort from the middle of the length of the water-line, multiply the distances of the centres of those sails that are before it into their areas, for the sum of the moments before; and the distance of the centres of those that are abaft into their areas, for the sum of the moments abaft; when, if the difference between the sums of the two moments be divided by the sum of the areas, it will give the place of the centre of effort, either afore or abaft the middle, according to which of the moments has the excess.*

EXAMPLE:—*Areas and Positions of the Centre of Gravity and Moments of Sail.* (*Fig.* 1, *Plate* II.)

SPECIES OF SAILS.	In relation to the load-water section.			In relation to a section passing through the middle of the water-line.		
	Areas.	Height of centre of gravity.	Moments.	Distance of centre of gravity from the middle.	Moments before.	Moments abaft.
Jib	2040. ×	87.3 =	178092.	138.	281520.	—
Fore course	4050. ×	56. =	226800.	78.	315900.	—
top-sail	4330. ×	109.5 =	474135.	78.	337840.	—
top-gallant-sail	1500. ×	158.8 =	238200.	78.	117000.	—
Main course	5408. ×	58.3 =	315286.4	12.5	—	67600.0
top-sail	5440. ×	117.3 =	638112.	14.	—	76160.
top-gallant-sail	1881. ×	172. =	324532.	15.5	—	29155.5
Driver	2831.5 ×	62.5 =	176968.7	100.5	—	284565.7
Mizen top-sail	2645. ×	99.5 =	263177.5	78.	—	206310.
top-gallant-sail	902. ×	136. =	122672.	79.5	—	71709.
	31027.5		2957975.6		1052260.	735500.2

Height of centre of effort, above the water-line $= \frac{2957975.6}{31027.5} = 95.3.$

Centre of effort before the middle of water-line taken from the fore-part of the stem to the after-part of the stern-post................................ $\Bigg\} = \frac{1052260-735500.2}{31027.5} = 10.2.$

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* See Architectura Navalis, Frederick Henry de Chapman, English translation. By Rev. James Inman, D.D., Chap. V. and VIII.

41. The quantity of sails will depend on the number of men employed to work them, and on the stability of the vessel; but it can only be necessary to consider the number of men, in vessels intended for commerce. In ships of war, the stability alone must govern the quantity of sail, the principal object of these ships being to obtain the greatest rate of sailing; as they have always a sufficient number of men, on account of working the guns, to work the sails, however large.

42. In determining the quantity of sail, the length and breadth of ships are the elements commonly used: *the length*, for the length of the yards or spread of sail; and *the breadth*, for the height of the masts or depth of the sails. The using of these two elements alone, in determining the quantity of canvas for a ship, may appear to show a want of system, since the form of the body, and the place of the common centre of gravity, may cause the stability of ships of the same length and breadth to be different; but while the relative length and breadth of the ship may make it desirable at times to vary the proportions of the masts to the yards, still the length and breadth are the best elements for obtaining them.

43. The common rule for determining the masts and yards by the length and breadth of the vessel, has been admitted by long use, and may be considered equally good with any of the rules at present given as approximations; for the yards must be governed by the length, in order that the sails may have a suitable spread; and the breadth, which determines the length of the masts, that they may have proper support by the spread of the rigging, has the greatest influence on the stability.*

44. From the masts and yards, determined by the length and breadth, we obtain the quantity of canvas, or area of sail, from which the moment of sail is obtained, and compared with the moment of stability. The comparison is formed with those ships that have their quantity of canvas and stability well proportioned. While it is of the first importance for every class of ships to have a proper power of sail, there is less difficulty in determining that, than in fixing the position of the sails; for, in giving to each class of ships the proper power of sail, it only becomes necessary to have the moment of sail in some terms of the stability, so that the ship

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* Various ingenious rules have been given, but as they commonly involve difficult formulæ, they are not so well adapted for general use. See Chapman's "Area of Sails;" Formulæ given by Lieut.-Col. Ringheim, of the Swedish Naval Engineers, Papers on Naval Architecture, Art 38. A rule frequently used for ships, is to take half the sum of the length of the lower deck and extreme breadth, for the length of the main-mast, and $\frac{8}{9}$ of the main-mast for the main-yard; for brigs, half the sum of the depth in hold, extreme breadth and length on deck for the main-mast; and for the masts of cutters, $\frac{3}{4}$ of the sum of the depth in hold, breadth extreme, and length on deck.

may not exceed a determined inclination, under certain circumstances. When these are defined, we have only to bring the moment of sail to the given terms of the stability, as calculated for the determined inclinations; or to estimate the moment of stability at the inclination under the given circumstances, and make the moment of the power of the wind on the sails equal to it.

45. By comparing the moment of sail with the stability, some fixed terms may be obtained, whereby, under similar circumstances, an equal inclination may be produced in the same class of ships. The manner in which one ship will carry sail, when compared with another of the same class, shows the necessity that some relative moment should be given, or some inclination defined, under certain circumstances, that the best performance may be obtained by a sufficient power of sail being given; while, by not having too much inclination, the lee-guns may be properly fought.

46. The Swedish author, Chapman, in his valuable little Treatise on the "Area of Sails," gives an example, in which, in a "reefed top-sail gale," that would be classed by our seamen as a moderate gale, with two reefs in the main and fore top-sails, one in the mizen top-sail, main and fore courses, and with the stay-sails that are commonly set in their service, the inclination was not more than 7½ degrees; and, in another case, with a "top-sail gale," equal to our strong breeze, with men at their quarters on the lee-side, the inclination did not exceed 7 degrees. That ships should not exceed this inclination in time of action, even in a strong breeze, to allow the guns to be effective, appears most desirable; but since the circumstances are so variable under which ships are brought into action, from the quantity of sail that may be set, or from the difference in the strength of wind, it would be very difficult to establish a rule on these grounds; while, if we have the stability calculated for ships of different classes, and which have been masted proportionally to their power, or have been found sufficiently stiff under all circumstances, we have then only to discover what power of wind would give a momentum of sail equal to their stabilities, or, what would be the same, to determine their moment of sail in terms of the stability.*

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* The stability is here calculated according to the rule given by Atwood, in a paper published in the Philosophical Transactions of 1798, of the Royal Society of London, Part 2, page 216; from which the correct stability may be determined when the height of the common centre of gravity is known. This rule is taken in preference to the French theory, by the metacentre, as given by Euler, Bouguer, and others; for, in ships in which the areas of the plane of flotation and relative distance between the centre of gravity of the ship and displacement are equal, the

Three-Deck Ships.		Two-Deck Ships.		Razees.		Frigates.		Corvettes.		Brigs, 18 Guns.		Brigs, 10 Guns.		Cutters.	
Moment		Moment		Moment		Moment		Moment		Moment		Moment		Moment	
Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.
2632121	3452	1750165	2290	1990646	2623	1276577	1647	554484	547	442413	409	247654	207	127657	102
MOMENT OF SAILS IN TERMS OF STABILITY.															
759		767		758		775		1013		1058		1196		1251	

Yachts.								Merchant Ships.					
Ships.		Brigs.		Schooners.		Cutters.		Ships.		Ships.		Brigs.	
Moment		Moment		Moment		Moment		Moment		Moment		Moment	
Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.	Of Sails.	Of Stability at 10° of inclination.
424083	347	157798	100.07	160778	176	57026	33	1475304	1547	607809	864	214132	209
MOMENT OF SAILS IN TERMS OF STABILITY.													
1222		1577		913		1728		953		703		1024	

47. The inclination produced by the force of the wind on the sails, may be determined very nearly, under different circumstances, by having the force of the wind and moment of sail, which may be brought into such terms as to compare them with the stability at different angles of inclination.

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height of the metacentre is the same, whatever difference there may be in the form of the body between the limits of the emersion and immersion, at the given inclination. It can therefore be relied on, only in cases in which the angles of inclination or heeling are very small. In Atwood's rule, the calculations may be more extensive, but in practice there is no more difficulty in estimating the quantities, than in any of those required for the most simple operation in the construction. See Papers on Naval Architecture, Art. 47, and Art. 10, Vol. 1, and Architectura Navalis, Frederick Henry de Chapman, English translation, by the Rev. J. Inman, D.D., note page 291.

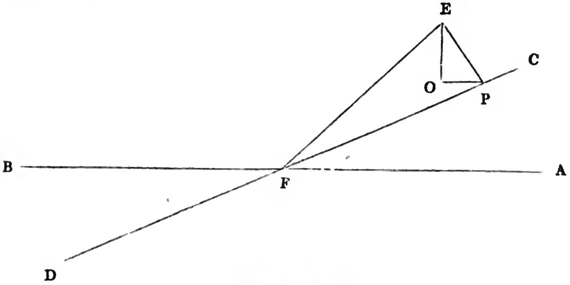
48. From the experiments made by Lynn, Smeaton, and others, we are able to compare, by the following Table, the power of the wind on the surface of a square foot, according as the winds are commonly distinguished by the seamen in our service; and having this, with the quantity and moment of sails, we can easily obtain the effect that is produced, and what degrees of inclination the ship will make under the different powers of the wind.

	Winds as commonly distinguished.	Power of Winds on a Square Foot.		SAILS COMMONLY SET BY THE WIND.
	Winds.	from	to	SPECIES OF SAILS.
		lb.	lb.	
1	Light Airs	.006	.05	Courses, top-sails, top-gallant-sails, royals, spanker, jib, flying-jib, and all light sails.
2	Light Winds ...	.09	.14	Do. do. do. do. do.
3	Light Breezes ..	.20	.27	Do. do. do. do. do.
4	Moderate Breezes	.36	.45	Do. do. do. do. do.
5	Fresh Breezes ..	.56	1.27	Royals and flying-jib taken in, in a sea way, to two reefs in the top-sails.
	Strong Breezes ..	1.45	2.27	Single-reefed top-sails, and top-gallant-sails, in much sea, two reefs in the top-sails to taking in top-gallant-sails.
	Moderate Gales ..	2.5	3.54	Double-reefed top-sails to treble-reefed top-sails, reefed spanker and jib.
	Fresh Gales	3.8	5.10	Close-reefed top-sails, reefed courses, to taking in spanker, jib, fore and mizen top-sail.
	Strong Gales	5.44	6.94	Reefed courses, close-reefed main top-sail, fore stay-sail, mizen try-sail, to taking in the main-sail.
	Heavy Gales	7.34	9.0	Close-reefed main top-sail, storm-stay-sails, to storm-stay-sails or close-reefed main top-sail only.
	Storms..........	9.53	13.6	

12

49. The quantity of sail set, and the power of the wind being known, the product of this power into the moment of sail set, shows the inclining force acting upon a ship under any circumstances whatever; and a comparison of this force with the degrees of stability of the body, will show nearly the angle of inclination which will be produced. When, therefore, it is required to ascertain the quantity of sail which will be necessary and sufficient for any ship, without exceeding the stability of the body, all that is requisite to be done is to compare the moment of sails in terms of the stability of the ship, with the moment of sails in terms of the stability, as given in the Table at page 19; it will then be seen whether the amount of sail is sufficient to propel the ship, without producing an inclination that would prevent the fighting of the guns; or which, on the other hand, by giving a greater degree of stability than is necessary for fighting the guns, would make the ship

uneasy when deep in the water. When it is determined what degree of inclination a ship ought not to exceed, on going into action in a strong breeze, and under double-reefed top-sails and top-gallant-sails, and having also the moment of sail and stability, we may construct with the certainty of producing the qualities essential to a ship of war.



EXAMPLE.

50. Let A B be the longitudinal axis of the ship, C D the yard, and E F the direction of the wind and its force: E F is equivalent to E P and P F, of which, E P = the effective force of the wind on the sails. Resolve E P into E O and O P respectively, perpendicular and parallel to A B: O P is the force that moves the ship a-head, and E O that which inclines her. If the ship is sailing 5½ points near the wind, with the yards braced 21° with the line of the keel, the wind will then strike the sails at an angle of 41°. The force of the wind, in a strong breeze, will be 2lbs. on a square foot; and according to the experiment of the Academy of Sciences, at Paris, the oblique impulsion at 41° would be to the direct force as .533 is to 1; but as the whole of this force will not be exerted to incline the ship (only the part that acts perpendicularly to the longitudinal axis), it will be reduced in the ratio of the sine of the angle which the sail makes with the longitudinal axis; and assuming the mast to be raked 7°, whilst the ship has an inclination of 5°, the plane of the sails would become nearly vertical, and therefore the inclination of the ship may be disregarded, as to its effect on the calculations. Now, the cosine of 21 = .93358, and the moment of sail = 127657, we have, therefore, $.533 \times 2\text{lbs.} \times .93358 \times 127657 = 126788.4\text{lbs.} = 566$ tons = the pressure of the wind on the sails to produce the inclination.

The wind on the hull will likewise have an effect to incline the ship: the moment of the surface of the hull = 31185, angle formed by the wind and hull, sailing 5½ points, about 62°, not considering the form of the side, pressure on a square foot about 2lbs., oblique impulsion, according to the experiments before taken, .85 to 1; we have therefore, .85 × 2lbs. × 31185 = 53014.5lbs. = 23.67 tons; and the whole pressure to incline the ship will be 566 tons + 23.67 tons = 589.67 tons; which force is about equal to the moment of stability of some of our frigates at an inclination of about 6°; so that, in a strong breeze, with single-reefed topsails and top-gallant-sails set, they would incline from about 6° to 7°.

51. In estimating the inclining force on the hull, the oblique direction in which the wind strikes it by the inclination and tumbling home of the side has not been taken into account, since the body meets the wind with an increased force; and the channels, and other projecting parts, and the wind on the rigging, are more than equivalent to it.

This example may be used in estimating the power of the wind on any other classes of ships, by supplying the quantities found in the Tables, given as examples, and by taking the pressure on the hull and oblique impulsion, from the following Tables.

Surface and Moment of the Hull above Water.			
CLASS OF SHIP.	Surface of the top-side above the water.	Height of centre of gravity of the top-side above the water.	Moment.
	sq. feet.	feet.	
Three-Deck Ships, 1st Class	7247	16.4	118850
Two-Deck Ships, 2nd Class	4774	12.7	60629
Frigate, 1st Class	2835	11.0	31185
28 large Class	2092	8.0	16736
28 small Class	1938	7.7	14922
Corvette	1368	5.94	8120
Brig, 10 Guns	909	4.66	4236
Cutter	536	3.58	1918

Experiment made by the Academy of Sciences at Paris.			
Impulsion on oblique Surface, according to experiment.			
Angle of Incidence.	Impulsion.	Angle of Incidence.	Impulsion.
90°	1.000	42°	.543
84°	.989	36°	.480
78°	.958	30°	.440
72°	.908	24°	.424
66°	.845	18°	.414
60°	.771	12°	.406
54°	.693	6°	.400
48°	.615		

52. After the explanation that has been given of the area, power, and position of the sails, it only remains to obtain their forms, and approximate to their quantities, by the easiest process; that the moment and centre of effort may be obtained and compared with those elements and data that have been furnished.

53. It is common to take the main-mast in terms of the breadth, and

the main-yard in terms of the length, and from these two proportions to determine the remaining masts and yards; or to determine all masts in terms of the breadth, and all yards and booms in terms of the length, and draw the sails in from them; but as any rule of this description has been considered only as an approximation (43) to the proper area and position of sail, the trouble will be considerably reduced, by fixing first on the surface of canvas and its proper position, and determining the masts and yards from it.

54. In fixing the proportions of different sails to each other, as the depth of the top-sails to that of the courses, of top-gallant-sails to top-sails, the depth of the top-gallant-sails to that of the courses, or the proportions of the sails on the fore and mizen-masts, to those on the main-mast, we shall be guided best by our observations as to the proportions that have been given to different ships, without any disadvantageous consequence in their application; for in every case in which the proportion of different sails to each other has been carried to an extreme, either way, experience has soon discovered the error, and determined the limits. Thus, making the sails too nearly equal, on the main and fore-masts, cannot be done without pressing the ship too much forward, or by carrying the fore-mast back, which not only obstructs the proper working of the yards, but prevents the wind having its full effect on all the sails. If the top-sails are too deep, in relation to the courses, there is a difficulty in shifting a top-mast; if the top-gallant-sails are too square, it is difficult to support the superincumbent masts, or if too narrow, the proper area of sail cannot be obtained without making the sail too taunt, or increasing the moment, in a greater proportion to the area than is necessary to bring the centre of effort to its proper height.

55. In the following Tables, the limits are given as taken from ships of each class, with differently-proportioned sails; and from them may be determined, according to the idea of the constructor, the proportions he may consider best, without the danger of exceeding the proper limits. If deep top-sails are considered desirable, it is only requisite to take the proportions under that head, and multiply the whole depth from the head of the top-gallant-sail to the bottom of the course at the middle, by them separately, when the depth of each sail is obtained. (See Example.) According, likewise, as the form requires a square or taunt sail, or proportionally so, it may be regulated by the proportions given for the height of the head of the main top-gallant-sail and breadth of the main course at the head, (see Table, page 24,) and so on, for the proportions of the fore and mizen-sails, to the main-sails.

CLASS OF SHIP.	Relative Depth of Courses, Top-sails, and Top-gallant-sails.								
	Deep Courses.			Deep Top-sails.			Deep Top-gallant-sails.		
	Courses.	Top-sails.	Top-gallant sails.	Courses.	Top-sails.	Top-gallant-sails.	Courses.	Top-sails.	Top-gallant-sails.
Three-Deck Ships	.33	.44	.23	.31	.47	.22	.31	.45	.24
Do. do.	.33	.45	.22	.32	.47	.21	.32	.44	.24
Two-Deck Ships	.36	.42	.22	.33	.45	.22	.34	.42	.24
Do. do.	.36	.43	.21	.34	.45	.21	.35	.41	.24
Frigates	.37	.41	.22	.35	.44	.21	.34	.42	.24
Do.	.37	.42	.21	.34	.44	.22	.35	.41	.24
Ship Yacht	..	..	..	.35	.43	.22	..	..	..
Corvettes	.40	.40	.20	.37	.42	.21	.37	.39	.24
Do.	.40	.39	.21	.36	.42	.22	.36	.40	.24
Brigs	.38	.38	.24	.36	.40	.24	.36	.38	.26
Do.	.38	.39	.25	.37	.40	.23	.37	.37	.26
Swedish 80	..	..	..	..	..	..	.32	.44	.24
Corvette	..	..	..	.35	.42	.23	..	..	..
Brig	..	..	..	.34	.41	.25	..	..	..
Merchant Ship	.33	.45	.22	.36	.43	.21	.32	.43	.25
Do. Barque	.42	.34	.24	.35	.40	.25	.37	.37	.26
Do. Brig	.41	.35	.24	.36	.40	.24	.36	.38	.26

EXAMPLE:—*Deep top-sail Three-deck Ships.*

Height from the foot of the course at the middle, to the head of the top-gallant-sail. = 147 feet.

147 × .31 = 45.57 feet = depth of course.
147 × .47 = 69.09 feet = depth of the top-sail.
147 × .22 = 32.34 feet = depth of the top-gallant-sail.
45.57 + 69.09 + 32.34 = 147.

In comparing the relative proportions of the courses, top-sails and top-gallant-sails of merchant ships, barques, and brigs, we find them varying so much, that it becomes difficult to give a common proportion under each head, but those in the Tables are about the mean.

Class of Ship.	Height of main top-gallant-sail above the water in terms of the breadth.		Height of fore top-gallant-sail in terms of the main top-gallant-sail.		Height of mizen top-gallant-sail in terms of the main top-gallant-sail.		Head of main course in terms of the length on water-line.		Head of fore course in terms of main course.		Breadth of the head of main top-gallant-sail in terms of the head of main course.		Breadth of the head of the fore top-gallant-sail, in terms of the breadth of main top-gallant-sail.		Breadth of the head of mizen top-gallant-sail in terms of the head of main.	
	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.	maximum.	minimum.
Three-Deck Ships ..	3.45	3.25	.92	.9	.8	.78	.48	.47	.87	.86	.49	.47	.89	.86	.68	.66
Two-Deck Ships....	3.45	3.25	92	.9	.8	.78	.49	.47	.87	.86	.49	.47	.87	.81	.7	.68
Frigates, large Class.	3.45	3.25	92	.9	.81	.79	.49	.47	.87	.86	.48	.46	.87	.85	.74	.64
Frigates, small Class	3.55	3.45	.91	.89	.82	.79	.52	.48	.88	.86	.49	.44	.88	.82	.73	.62
Corvettes	3.55	3.45	91	.89	.8	.75	.51	.49	.89	.86	.5	.41	.9	.87	.76	.66
Ship Yacht	3.62	3.61	.91	.9	.83	.82	.48	.47	.86	.85	.47	.45	.92	.90	.75	.73
Brigs...............	3.5	3 4	.94	.92			.5	.47	1.0	1.0	.52	.51	1.0	1.0		
Swedish two-Decks .	3.3		.91		.71		.502		.9		.5		.9		.72	
Corvette	3.4		.9		.8		.5		.9		.46		.9		.7	
Brig	3.2		.95				.504		1.0		.45		1.0			

56. In the preceding Tables of proportions of the sails, as ships of different rates have been rigged, there appears but little difference either in the proportion of the tauntness, in terms of the breadth, when taken above the water-line, or in the squareness of the rig, in relation to the length of the water-line of three-deck ships, two-deck ships, and the large class of frigates; from which it would appear, that an increased depth of sail has been given, only in proportion as the height of the hull has been diminished, by keeping the extreme height in a constant ratio to the breadth, without giving the advantage of sail to those ships that have less upper weights, and less inclining force by the pressure of the wind on the top-side. This would show that the additional stability obtained by the increased breadth of two and three deck ships, is equivalent to the loss of stability, that would be occasioned by raising the centre of gravity, and for the increased pressure on the higher sides; or that these classes of ships are not masted proportionally to their stabilities: this, however, can be known correctly, only by having the exact quantities of the weights above, for each class, and their excess over the frigates; or by obtaining the correct place of the common centre of gravity of the body, that the proper measure of stability for the several classes of ships may be got; with this every ship may be compared,

without distinction of class, and every advantage may be taken of giving an increase of sail in a proper relation to the reduction of the height and weights above. But as this element has never been correctly calculated for the different classes of British ships,* the only alternative is to compare each class of ships separately, as shown in a preceding article (55), and rest satisfied to know (till by a closer investigation of these points, the importance of finding this element shall be seen) that practice has given to these different classes the same proportion, without taking into the account all the circumstances by which different classes of ships are influenced when under sail.

On determining the Sail.

57. To draw the area of sail, the positions of the masts should first be determined; but as the sails, in the first instance, are drawn in only to compare with other ships, and to bring the point of sail, and the fore and after moments, within the limits, and according to the rules before laid down (37 and 46), it will be sufficient to take the positions of the masts from the examples given under the different rigs, and alter them as the results may require.

58. As the surface of the sail, when the yards are braced up, is somewhat before the mast, it will be necessary to determine the line or axis upon which the sails revolve, as nearly as possible; this line will be more or less forward, according as the top-masts, or top-gallant-masts, project before the lower masts; and, as it regards the lower yards, it will be according to the angle of the stay and shrouds, or as the trusses are eased off, and will be found to vary in different ships of the same class, through other circumstances connected with the rigging: the limits, however, will be such, that if .05 of the breadth for the main and fore, and .038 for the mizen, before the centre of the masts, be taken, there will be no error of importance; since it will be found, that the position of the above axis will be, in some ships of the same class, rather further forward, and in others, rather further aft than these proportions.

59. The rake of this line, or axis of the sails, will be somewhat less than the intended rake of the mast; since the plane of the sails, when the yards are braced sharp up, will be about the diameter of the yard before

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* The height of the common centre of gravity of a ship, may be calculated by having a correct table of weights of the furniture, stores, &c., belonging to each class of ships; the calculations, however, are extensive, and the trouble unnecessary, as it may be so easily determined by experiment. See Papers on Naval Architecture, Art. 3 Vol. 1, and Art. 3, Vol. 2.

the top-gallant mast, at the tie, and will be well with the lower side of the lower yard; with this position of the sails, however, it will seldom be more than .01 of the height less than the rake, when the trusses are eased off. When these lines are determined, set up on them the heights for the heads of the top-gallant-sails, the main in terms of the breadth, and fore and mizen in terms of the main, from the proportions given in the Tables, or as may be assumed; and also the height of the lower part of the course at the middle, which is determined by the heights of the boats, for the main, and by the main-stay, when it is carried to the stem, for the fore; but the sail-maker commonly takes 3 feet 6 inches for the main, and 3 feet 3 inches for the fore, above the deck; but this would be too low, according to the present method of placing the fixed blocks, and roaching the sails, as the clues could not be brought down sufficiently to bring the leech tight. Draw the line, therefore, for the foot of the courses, 6 inches above the bulwarks or hammock-rails; or if low bulwarks, according to the height of the boat for the main, and fore-stay for the fore.

60. Let the distance between the determined height above the deck, and the height of the head of the top-gallant-sail, be divided into three parts, according to the proportions given in the Tables (55), and as it may be intended to proportion the sails; at these spaces, which give the divisions for the courses, top-sails and top-gallant-sails, draw lines perpendicular to the axis of the sails. Upon the lower one, which is the head of the course, and the upper one, which is the head of the top-gallant-sail, set off for the breadth of the sails from the proportions given in the Tables (55), or as may be determined; the one for the main course in terms of the length, and for the head of the top-gallant-sail in terms of the course; setting off likewise upon the corresponding lines on the fore and mizen, the proportions given, in terms of the main, for the sails on these masts; and draw lines to them, to represent, for the present, the leeches of the top-sails and top-gallant-sails.

61. The mizen course being a sail that is seldom set, and not being subject to the same rule as the main and fore courses, as to its form, or in relation to the sails above, the height of the cross-jack-yard must here be first determined, which is placed, varying from .89 to .91 with that of the main-yard above the water, according as it is intended to have a high or low mizen-mast: let therefore the distance between the cross-jack-yard and head of the mizen top-gallant-sail, be divided into two parts, having the same proportion to each other as the parts of the main top-gallant-sail and main top-sail; and let the foot of the mizen top-sail be in the same proportion to the head of the mizen top-gallant-sail, as the foot of the

main top-sail is to the head of the main top-gallant-sail. By making the sails in proportion, and similar to each other, they produce a more agreeable appearance, without practical inconvenience. For the leeches of the courses, draw a line from the proportion given at the head, to the breadth they are intended to be at the foot; the main-sail has in general a greater spread, in three-deck ships from 4 to 7 feet, and in smaller ships from 3 to 6 feet; but this cannot be carried beyond the limits prescribed by the cut of the sail, that it may stand well, and by the spread between the tack and sheet blocks. That the sail may stand well, it requires an equal strain to be brought on the foot and leech ropes; for if the sail is acted on too much up and down, the foot will become slack, or if too much in a fore and aft direction, the leech will become slack; consequently, too much care cannot be taken in fixing these blocks for the tacks and sheets; or, if the blocks are fixed, in cutting the sail to them.

62. The fore-sail is sometimes narrowed at the foot, for bringing the tack to the boom-kin, formerly about 3 feet 9 inches in two and three deck ships, and in other ships about 2 feet: this quantity, however, may not be invariable; for when the boom-kin can be carried sufficiently forward to bring the tack properly down, it will be better to lessen the narrowing, not only on account of gaining sail, and for appearance, but the sail will, in general, stand better with parallel leeches.

63. The foot of a course is made parallel to the head $\frac{3}{5}$ its breadth at the middle, and sometimes to two cloths within the outer buntline cringle, from which place the clues are carried down to give the roach. The roach of the foresail in three-deck ships is 5 feet 6 inches, in two-deck ships 4 feet 7 inches, and in all other classes of ships 3 feet; and for the main-sail in three-deck ships 6 feet 6 inches, two-deck ships 5 feet 6 inches, frigates 3 feet 9 inches, and smaller ships about 3 feet. The main-sail and fore-sail should, however, be roached from the $\frac{2}{5}$ of the spread of the foot, or outer buntline cringle; the roach however may be such, that when the depth at the middle is fixed, as well as the tack and sheet blocks, the foot and leech ropes shall be properly acted on.

64. Before the form of the leeches of the top-sails and top-gallant-sails can be determined, lines must be drawn at a distance apart, equal to what the clues and heads must be separated by the sheet and clue blocks; this will always be, according as the block on the yard-arm for the sheet is a strapped or a cheek block; if $\frac{1}{8}$ of the depth of the top-sail is set below the stops of the lower mast for the head of the course, and $\frac{1}{11}$ of the same depth for the clue of the top-sail, the space left for the blocks will be about right, according to the block or rate of the ship; and the distance

that the head and foot are separate, must be taken off from each sail, in a proportion from each, according to the depths of the sails respectively; or else the true proportion of the sails, as first determined, will not be maintained. When the correct lines for the heads, and depths of the clues of the sails, are drawn, the leeches of the top-gallant-sails and top-sails may be completed.

65. The line at first drawn is to give the heads and clues of the courses and top-sails and top-gallant-sails, at the cleats on the yard-arms; but as an allowance must be made for stretching, which, according to the present custom, is 9 inches for the top-sails and courses, and 6 inches for top-gallant-sails, the line for the heads must be drawn for top-gallant-sails 6 inches, and for the top-sails and courses 9 inches, within the first drawn line, to give the leeches; but as the leeches of the top-sails are commonly hollowed for taking in the lower reef, it will be requisite to obtain the length of the top-sail-yard before they can be determined.

66. According to the present method of hollowing the leech of the top-sails, the lengths of the main and fore-top-sail yard-arms are each $\frac{1}{12}$ the whole length of each yard respectively, without the cleats or clues of the top-gallant-sail, and $\frac{1}{14}$ for the mizen; consequently, if $\frac{1}{10}$ of the spread of the top-gallant-sail at the foot, for the main and fore, and $\frac{1}{12}$ for the mizen be set without the clues on each side, we have the whole length of the yard. At $\frac{7}{8}$ of the given diameter of the outer end of the yard, from each end, is placed a shive hole for the reef tackle or pendant; the outer part of this shive will determine the spread of the sail at the lowest reef. Set down, therefore, from the head $\frac{1}{2}$ the depth of the top-sail, for the place of the lowest reef, and below it 1 foot 6 inches for the lowest reef cringle; when the breadth of the outer part of the shive is set off at this distance down, it will give the spread of the sail at the lowest reef, or breadth of the sail at this place. The shives will be obtained, if the diameter is not determined, by setting in $\frac{1}{67}$ of the whole length of the yard, within each end. Then, through the breadth of the sail at the head, the breadth at the lowest reef, and breadth of the clues, pass a curve, which may be an arc of a circle, and the leeches of the top-sails are thus obtained, by the common method of hollowing them.

67. This method of fixing the length of the top-sail yard-arms, or the distance of the head of the sail from the end, will cause the hollow given to the leeches of the top-sails always to be more or less, according as the lengths of the lower yards exceed the lengths of the top-sail-yards; which, in some cases, may give a very considerable hollow. The hollow given to the leeches of top-sails appears to have originated in the top-sail yard-

arms not being sufficiently long without the sails to take the lowest reef; but if the length of the arms beyond the head of the sail had been increased to lessen the hollow, or to have made the leeches straight, as those of other sails, the top-sails would not only have stood better, but have had a better appearance, without occasioning any practical disadvantage, besides that of the increased weight of the additional length of the yard-arm.

68. The mizen top-sail for ships, and main and fore top-sails for brigs, with the top-gallant-sails for both, are commonly roached; as are also the mizen top-sail for leading the main top-sail brace, and the top-gallant-sails for clearing the top-mast stays, when the top-sails are reefed. The mizen top-sail is commonly roached as much as 4 feet 6 inches; though the reach is sometimes diminished, by altering the position of the main top-sail braces; this alteration, however, while it may reduce the roach of the sail, produces, very possibly, a worse effeet, in bracing the main top-sail yard; since by carrying the braces lower down, they form a greater angle with the yard. The top-sails of brigs are commonly roached about 1 foot 6 inches, and all top-gallant-sails about 2 feet. To lessen the roach in the top-gallant-sails would be somewhat advantageous with whole top-sails; but when the top-sails are reefed, the top-gallant-sails must be kept higher, and not sheeted home. The quantity of roach that is intended to be given to the top-sails and top-gallant-sails, is set up above the line for the foot at the middle of the sails, and an arc of a circle described from it to the clues.

69. The remaining sails by which the proportion of the mast, yards, &c., is got, and the power and position of sail compared, are the jib and the driver. The position of the jib will be according to the length of the bowsprit and jib-boom, the length of which will be determined so as to give a proper support to the fore-mast and fore top-mast, and will depend on the angle formed by the fore top-mast stay and the fore top-mast.

70. This angle, of the fore top-mast stay and fore top-mast, to give the proper support, should not be less than 34°, or seldom more than 38°; which being decided on, if a line be drawn to it from the stops of the fore top-mast, intersecting the stive of the bowsprit produced out, it will determine the length of the bowsprit, or place of the shive, in the starboard bee block. The stive, however, of the bowsprit will affect its length; the less the stive, the greater must be the length of the bowsprit, within the limits commonly given to the stive, which limits may be seen in the examples given of the proportions for different classes of ships, in another part of this work.

71. The angle formed by the jib-stay and fore top-mast-stay, varies commonly from 48° to 52° with the top-mast; with these angles they not only have a good appearance, but the jib may be properly carried. Schooners and brigantines are seldom so much; schooners from 45° to 48°, and brigantines from 46° to 48°. Draw from the stops of the top-mast, which will be as much above the head of the top-sail as the clue of the top-sail is below the stops of the lower masts, a line to the intended angle to cut the jib-boom, when the outer part of the shive will be obtained; this line will represent the jib-stay.

72. The common size given to the jib at the foot, is the length of the jib-boom and one cloth; for the leech, as many yards in depth within one, as there are cloths in the foot, and for the luff or stay, every cloth is roached 3 inches, or the fore edge of each cloth is carried down 3 inches without a perpendicular from its edge.

73. This rule gives the size of the sail after the jib-boom is found; but as we have here to draw the sail first, it will be necessary to determine it in some terms of the length, as the element to which its dimensions bear the best relation; if, therefore, we take .27 the length of the water-line for large frigates, and all upwards, and from .28 to .3 for smaller vessels, for the foot of the jib .8 the length of the top-mast-stay for the luff, and .8 of the luff for the leech, we shall have a well-proportioned jib, which will stand well, provided the sail-maker gives the proper round in the luff and foot; the leech, however, may be somewhat longer, when the bowsprit stives a great deal, to avoid carrying the jib-sheet too far aft, to prevent the foot rope from being slack. These proportions will form the sail very nearly as it is cut by the sail-maker; but if it is required to be exactly so, we have only to determine the foot, by the given proportion of the length of the water-line, to which the jib-boom may be made in relation; the leech in the given proportion of the foot, and the foot to form the proper angle according to the rule of roaching, which, when drawn in, must be made to cut the stay from 6 to 9 inches above the jib-boom.

74. To determine the outer end of the bowsprit, when the length of the foot of the jib and angle of the jib-stay are fixed, take for the length of the jib-boom 23 inches, or the breadth of a cloth less than the foot of the jib, and for the place of the outer end of the jib-boom set without the jib-stay .03 of its length, and from this distance set in its length, in the direction of the stive, for the inner end: then, as one-third of the jib-boom scarps on the bowsprit, we have only to set out this proportion from its inner end, and we obtain the outer end of the bowsprit; and for

the whole length of the bowsprit, we have only to set in the housing, which is commonly about .3 of the given length; but this proportion must depend on the position of the fore-mast, which mostly determines the place of the partners.

75. In drawing in the driver, the depth of the luff is determined as follows :—the neck* of the sail is generally on a level with the cat-harpin legs, or the height as before determined for the cross-jack-yard, when the gaff is worked on a try-sail mast; but when worked on the standing mast, it can seldom be got so high; and the tack is brought to the saddle, which in ships of the line and frigates, is about 4 feet 6 inches above the deck, and in flush deck vessels, as low as the boom can be conveniently worked, over the poop or barricading. For the length of the foot, the boom is commonly made 2 inches less in every yard of the length of the main top-sail-yard; and the sail for stretching, is short of the length of the bo~~at~~m 3½ inches in every 3 feet at the foot, and short of the length of the gaff, 1½ inch in every 3 feet for the head; the cleat or gaff will be placed for the sail, when stretched, and the sluice .02 at the foot of the sail within the end of the boom, less than the boom; the clue, however, may be carried aft, so as not to extend beyond the after part of the stern-post at the water-line, for ships of the line .2, large class frigates .21, small class of frigates, and corvettes, .23; and for the fore and after main-sails of brigs, from .16 to .19, the length of the water-line. The line for the foot, which will be a chord to the round commonly given to it, will rise towards the after end about 1 inch in every foot more than the sheer. For the proportion of the head to the foot of this sail, and the proportion of the leech to the luff, which determines the peak, we cannot exceed certain limits for the sail to stand well; but experience has shown, that the prescribed limits afford considerable scope in giving the form. Line-of-battle ships in general have the head .7 of the foot, and the leech twice the luff. Frigates have the same proportion for the head, but the leech is seldom more than 1.6 the luff; while some corvettes have the head .75 the foot, and leech only 1.5 the luff, and brigs the head .6 the foot, and leech 1.5 the luff. When the size of this sail is got, from the terms on which its dimensions should depend, it is then necessary to determine what the gaff will require to be beyond the sail. The cleats are, in general, without the sail, in three-deck ships about 3 feet, in two-deck ships 2 feet 4 inches, frigates 2 feet, and smaller vessels

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* The neck, or nock, is the upper and the fore corner of the sail, and the after and upper corner is called the peak.

about 1 foot 8 inches, for stretching; and the given length without the cleats the diameter of the gaff, and without which 3 to 6 feet is commonly added for displaying signals; but it is in general the case, that all the common rules are deviated from, and a great deal is left to the officer commanding: however, it would appear most desirable that some general rule should be observed, which should bear a relation to the spread of the sail at the head: if therefore we set without the peak $\frac{1}{18}$ of the head of the sail for the cleats, and without the cleats $\frac{1}{34}$ for the given length, we shall have a gaff that will bear a good proportion to the sail, and will not be far from some of the best proportions commonly observed; without the given length add 3 to 6 feet, for displaying signals.

76. When the forms and dimensions of the sails are completed according to the preceding rules, the centre of effort may be got according to the example given (22), and the power and points of sail compared, according to the data that have been furnished (Art. 37 to 46); and when all the corrections are made that may be thought necessary, by comparing with the different elements of construction, the lengths of the masts and yards may be determined from the sails.

The rules for determining the lengths of the top-sail yards, bowsprit, boom, and gaff, have already been given, according to those used by the sail-maker to get the size of the sail.

77. To determine the length of the lower masts, it will be necessary first to get the true position of the head of the course, in relation to the stops. To obtain the depth of the course, the sail-maker takes from the hounded length of the mast the part that is housed to the uppermost deck, the height of the foot of the sail above the deck, and the distance the yard is below the hound, for which he in general takes $\frac{2}{3}$ the length of the mast-head.

78. This rule, however, for placing the yard is different from that commonly observed by seamen, as they in general take half the length of the cross-tree and set it down from the lower side of the opposite trestle tree; which rule, if applied to a 46-gun frigate, would place the yard nearly 4 feet higher than the position that would be taken for cutting the sails; and, in consequence, make the top-sails too deep, which is frequently found to be the case; and should the yards be placed according to the sail-maker's rule, with the disposition of the fixed blocks, while the tacks and sheets are worked on the quarter-deck, forecastle, and waist, it would be impossible for the main-sail to stand without more height above the deck, than with the present roach. Under these circumstances, it appears desirable that some general rule should be observed, both by

the sail-maker in cutting his sails, and by the seaman in fixing the cat-harpins, or placing the yards.

79. In determining both the length of the mast head, and place of the cat-harpins, it would be more consistent to have them in terms of the top-mast; for, according to the present method of determining the length of the mast head, it must vary inversely as the length of the top-mast; since the extreme height of the sail in most cases is the same. We must, therefore, as we diminish the length of the lower-mast, increase the length of the top-mast; consequently, with the longest top-mast we get the shortest mast head; and for the cat-harpins to act properly against the top-mast shrouds, they must be carried down as the spread of the top is increased, which is always in proportion to the length of the top-mast. In brigs, where the fore and main top-masts are, in general, the same length, a considerable difference is given to the length of the mast heads, by having it in proportion to the lower-masts. That the proportion of the extreme height of the sails of the fore-mast may be preserved, it is necessary to have a shorter fore-mast; consequently, the fore top-mast, which is the same length as the main, and has the greatest stress, must have the least length of mast head to support it; one of the mast heads must therefore be longer than necessary, or the other too short.

80. From these circumstances it would appear desirable, though experiment may not as yet have made the discovery, that the length of the mast head should be in terms of the top-mast. If the length of the top-mast be multiplied by .28, it will give the length of the mast head, which will not differ much from the present length, except in extreme cases; and for the distance the cat-harpin legs, or place of the centre of the yard, or head of course, is below the stops, $\frac{1}{8}$ the depth of the top-sail.*

81. According to the usual method of determining the length of the mast head, by the mast-maker's rule, and placing the yards according to the sail-maker's rule, the stops of the mast will be above the head of the course $\frac{4}{27}$ the depth of the course from the head to the heel of the mast, and the length of the mast head will be $\frac{2}{9}$ of the same depth, above the stops, to the given length of the mast, without the additional length of head, above the head of the course.

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* For the hounded lengths of the lower-masts and top-masts to be given only, would appear the most simple way of fixing the dimensions, since upon these the height of sails depends, and as the heads are for the support of the masts above, it seems most proper for them to be given in terms of these masts, and added afterwards, except in such classes of vessels as cutters and schooners, where it requires to be determined by the length of the gaff. For lower-mast heads to be .3 the hounded length of the top-mast; and top-mast heads, .24 of the hounded length of top-gallant-masts, would give the adequate support, and always be in a true relation to the masts above.

82. The depth of the top-sail is 4 inches in the yard less than the given length of the top-mast, which reduction is equal to the top-mast head without the additional length, and consequently makes the top-sail equal to the hounded length of the top-mast; the stops of the top-mast must therefore be above the head of the top-sail, as much as the clue is below the stops of the lower-mast, or about $\frac{1}{11}$ the depth of the top-sail, and the head of the top-mast will be $\frac{5}{32}$ of the hounded length, or $\frac{1}{8}$ above the stops for the place of the given length.

83. The depth of the top-gallant-sails is 3 inches in a yard less than the given length of the top-gallant-mast, and the stops of top-gallant-masts are below the given length 3½ inches in a yard; consequently, the stops of the top-gallant-mast will be above the stops of the top-mast ½ an inch in a yard, or $\frac{1}{72}$ less than the depth of the top-gallant-sail, and the place of the given length will be above the stops $\frac{7}{65}$ of the hounded length, or length of the top-gallant-masts to the stops. For the length of the pole, or length to the royal stops, there is frequently a considerable difference; however, it is more frequently made $\frac{9}{13}$ of the given length, or from the place of the given length, half the given length is set upon it. The sky-sail pole is beyond the royal stops, commonly about $\frac{2}{9}$ of the given length; this pole however should be shortened as much as possible, when sky-sails are not carried, as producing unnecessary weight, where it is of the greatest disadvantage.

84. The end of the lower and top-gallant yards will be without the cleats $\frac{1}{22}$ of the distance between the cleats.

85. In giving the proportions and rules for determining the masts and yards from the sails, we are not able to bring them into a more simple form, as they must be according to the rules that are commonly observed by the sail-maker; this, however, will not apply to the depths of the courses: to determine which, the heights of the boats, and main stay, with the place for the blocks for the tacks and sheets, and the bolts for the standing parts, should be drawn in, and the depth of the courses determined accordingly, so as to produce an equal strain on both the foot and leech ropes.

On determining the Sails for Cutters.

86. ***Main-sail.***—The height of the nock of the sail above water, is the breadth of the cutter multiplied by 2.4 to 2.6, with the maximum quantity of sail; but in Revenue cruisers with great breadth in proportion to their length, it seldom exceeds the breadth multiplied by 2.1 or 2.2. The distance from the nock to the upper part of the boom, gives the depth of the luff, which the height of the saddle will determine. The leech is from 1.4

to 1.6 the luff. The clue of the main-sail abaft a perpendicular drawn through the after part of the stern-post at the water-line, is from 2.1 to .3 the length of the water-line, the length of the foot is from this distance, to the after part of the mast, and the spread of the head is from .6 to .66 of the foot; it is, however, in some of our Revenue cruisers .74. A line that would be a chord to the curve of the foot of the main-sail, commonly has an elevation aft varying from about 1 foot in 12, to 1 foot in 10 above the level of the water.

87. *Fore-sail.*—The foot of the fore-sail is commonly .9 the distance between the stay and the fore part of the mast, the luff from .8 to .87 the length of the stay, and the leech .8 of the luff. *Jib.*—The distance of the tack of the jib before a perpendicular drawn through the fore part of the stem at the water-line, is from .55 to .6 the length of the water-line; the length of the foot of the second jib, is the distance from the tack to the fore part of the stem, the luff from .8 to .85 the length of the stay, and the leech of such a length that the foot may be a proper height for the sheet to bring an equal strain on the foot and leech ropes. The stops of the mast will be above the nock of the sail $\frac{1}{11}$ the distance from the nock to the heel of the mast, and the length of the head above the stops will be $\frac{8}{33}$ of the same distance. The bowsprit is from 8 to 9 inches without the jib; from this distance to the bow will give the outer part of the bowsprit, to which must be added, what the bowsprit is housed, which will give the whole length. For the length of the boom, set beyond the clue of the sail, .08 the spread of the foot, and for the length of the gaff, set beyond the peak, .06 the spread of the head of the sail.

On determining the Sails of Schooners.

88. *Main-sail.*—In common schooners the height of the nock of the sail above the water, is the breadth of the vessel multiplied by from 2. to 2.2; and the fore-sail is from .9 to .94 of the main. In Bermuda rig, the height of the nock of the main-sail is commonly the breadth multiplied by 2.2 to 2.4, and the fore-sail from .94 to .97 of the main. The depth of the luff is obtained both for the main and fore as for cutters, and the leech from 1.2 to 1.3 of the luff, or for the head to form an angle with the horizon from 25° to 30°. The clue is abaft a perpendicular drawn through the after part of the stern-post at the water-line from .2 to .26 the length of the water-line, this determines the foot of the main-sail, as for cutters; and the head, from .5 to .58 of the foot: common schooners have the squarest head. The head of the fore-sail, to Bermudas, is from 1. to 1.1 of the main, and the foot from 1.4 to 1.5 of the head. Common schooners have the head

of the fore-sail less, varying from .75 to .9 of the main. Schooners have commonly a fore-top-sail standing, and a main-top-sail set flying. The foot of the fore-top-sail, from .52 to .6 the length of the water-line, and the head from .62 to .9 the foot, and the hoist about once the breadth of the vessel; the top-gallant-sails are commonly set flying. The tack of the jib is before a perpendicular drawn through the fore part of the stem at the water-line from .41 to .46 the length of the water-line, and the foot of the jib from .32 to .35 the length of the water-line. With these proportions the length of the bowsprit (or boom-kin) and jib-boom may be determined, as in the Rule given for ships.

89. The stops of the mast will be above the nock of the sail $\frac{1}{17}$ the depth from the nock to the heel, and the head above the stops $\frac{9}{68}$ of the same depth. The height of the square-sail-yards will be their diameter above the upper part of the gaff, and the stops of the top-mast above the head of the top-sail, $\frac{1}{9}$ the depth of the top-sail. The pole is commonly half the hounded length of the top-mast.

90. In the three-mast schooners, the height of the nock of the main-sail is from 2.3 to 2.6 the breadth; nock of the fore-sail .94, and mizen .65 of the main. The proportions in every other case are the same as for Bermuda schooners.

On determining the Sails of a Brig forward, and Schooner aft.

91. The nock of the main-sail of this rig, is commonly from 2.3 to 2.5, and the height of the fore top-gallant-sails, from 3.7 to 3.84 of the breadth, with the same rule observed, and having the same proportions for the main, as schooners, and the fore-sails as brigs and ships. The spread of the fore-course at the head, is from .4 to .48 the length of the water-line, and head of the top-gallant-sails, about .45 of the course. For the head-sails the same rules are commonly observed as for schooners.

92. When the sizes and situations of the sails are determined, so that they may produce the best effect in propelling the ship, it then remains for the art of seamanship to appoint methods for rightly bracing the yards and trimming the sails, under all the different directions and variations of the wind and sea; and, though it may not be proper to enter upon seamanship generally, it may still not be uninteresting to show, how the best effects may be produced by the sails, in preserving the equilibrium, and impelling the body; and while there may be nothing new in the observations to the experienced seaman, they may still be of some advantage to the student.

93. Nothing conduces more to the effect of a sail, than its surface being

brought as near as possible to a perfect plane. All slack canvas, whether sailing by the wind or large, lessens the effect of the sail; and even before the wind, when the slack reef is out, the power which acts on the sail will be reduced very considerably on the curved surface, less even than the base of the same curve, or than if the sail were set taught up, but reduced to the same hoist or distance between the yards as when slack.

94. The effort of the sails in propelling the body is most powerful, when, being trimmed to the most advantageous angle with the line of the course, the planes of all the sails are at the same inclination. This, however, cannot always be the case, since it will often be necessary to give the fore and after sails different angles, to preserve the equilibrium, when increasing or decreasing sail at either of the extremities cannot be permitted. And it will be found commonly the case, that the after-yards are braced sharper up than the fore-yards; which, by the stream of the wind being brought more a-head before it strikes the after-sails, produces an effect nearly the same as if the sails were in planes parallel to each other, when the whole of them are so trimmed as just to touch at the same time. But if all the sails are not trimmed to the same angle, so as to touch together, part of the effect of them will be lost.

95. When the sails are not set perpendicularly to the longitudinal axis, or when the force of the sails is not communicated in the direction of the line of the keel, the body will follow a course more or less oblique, according to the direct and lateral resistances, the angle to which the yards are braced, or angle of the sails, and the oblique impulsion of the wind on the sails: this course is called the lee-way, which will be, in some ships, when close-hauled, from two to three points from a fore-and-aft line, or line of her keel, but, frequently, long and fast ships in smooth water will not make more lee-way than from 8° to 12°; and, according to Euler, in the tables he has given in his *Théorie complette de la construction des Vaisseaux*, for long and fast ships, when the yards are braced at 85° with the line of the keel, the angle of lee-way is 1° 37′, and for short ships, 4° 36′; and when braced to 25°, for long ships 8° 1′, and short ships 21° 43′; which agrees, very nearly, with the limits assigned by experienced seamen. However, it will be found to vary in the same ships under different circumstances, even with the bracing of the yards and the inclination of the wind on the sails the same; for, as the increased force of the wind makes it necessary to reduce the quantity of canvas, the ship will often make much more lee-way, from the wind acting with its increased force on the hull, as well as on the sails; while, by reducing the surface of sail, the surface of the hull will bear a greater proportion

to the sail, than it did before the reduction. It is frequently owing to the increased lee-way produced by this and similar circumstances, that the ship, which before was carrying a weather helm, will carry her helm slack, by the state of the sea; for the water then acting more powerfully on the lee-quarter, makes it necessary, in order to preserve the equilibrium, to check the lee fore-braces, or to brace the fore-yards less sharp than the main. Other circumstances, such as the form the sail assumes, the action of the water on the lee-side, the nature of the sea, &c., will cause the body to have less ardency, or to carry less weather helm. These causes for the lee-way, &c., which cannot be met by placing the masts or by the form of the vessel, may be counteracted in a degree by an experienced officer attending to the trim of the sails.

96. If the sails were always perfect planes, the pressure, which is greater on the weather leech, and which is known to act more powerfully on the weather brace, would continue to increase with the wind; but as the sail, by increased pressure, forms different curves, as the wind has more or less force, the pressure on the weather leech becomes greater or less, and consequently gives the ship a greater or less tendency to come to the wind; and when there is increased way produced by a fresh wind with the same sail, the water will act more powerfully on the lee bow, where it has a more direct effect; and as the mean resultant always passes before the common centre of gravity, the increased effect will give more ardency to the body, and make it frequently necessary to brace the head-yards sharper than the after-yards, especially when there is but little sea, and when it is a-head; while, if the sea is on the weather bow, and more so if the ship is full forward, it will require the fore-yards to be braced less sharp than the main, or the surface of head-sail must be reduced.

97. The quantity of the lee-way will depend not only on the lateral and direct resistances, but on the angles to which the yards are braced with the line of the keel, and the angle of impulsion of the wind on the sails, under different winds and seas; it is, therefore, of the first importance that the yards should stand in a proper relation to the angle formed by the direction of the wind, and the line of the course, both as it regards impelling the body through the water, and that the ship may continue to carry a good helm.

98. The determination of the proper angles for bracing the yards, cannot be entered upon here, since it would require immense calculations for the simplest case; while tables derived from correct observations will be more suitable and convenient than rules deduced from calculations not verified by experiment. We shall, however, give the Tables formed by

Bouguer and Euler, and the results given by Don Juan on a single ship, and leave the application of them, as further observation may authorise; which, very possibly, is all that can be done in the present state of our knowledge of the subject. Experience, however, has determined that the yards may be braced sharp as you increase the press of sail: fast and clean ships, sharper than full ships; small ships sharper than large ships, under similar circumstances; always observing that, the flatter the sails the sharper they may be braced.

99. We know that seamen commonly brace up as sharp as possible,* and keep one point of the sail just lifting; this may be proper under some circumstances, and then only when the ship has 5 or 6 knots way through the water, or has acquired considerable momentum; but with little velocity,the angle of the wind on the sails should be more open, or, according to the common term, the sails should be kept wrapt full, to produce the best effect. According to the experiments made by the Academy of Sciences at Paris, Chevalier Borda, Robins, and others, the angles made by the wind on the sails need not be so great as common theory dictates, which gives the impulsion in the duplicate ratio of the sine of incidence; for oblique impulses at small angles produce a much greater effect, in impelling the ship in the direction of her course, than has been generally supposed; and it has been verified by experienced seamen that, at the angles to which yards were commonly braced (which were much greater than proper to produce the best effect), while there was considerable way through the water, the sails might be kept just full or lifting, and yet the body gain well to windward.

100. According to Bezont, Gower, and others, whatever angle the wind makes with the line of the course, the tangent of the angle between the wind and the sails should be double that formed by the sail and the course, to produce the greatest rate of sailing.

101. This, however, does not agree exactly with experience, nor with the experiments made on the oblique impulsion of the wind on the sails, and can only be the case with the first impulse, for it is quite uncertain, when the particles have impinged on the sail, what course or stream they follow; and as the vessel gains way, till an equilibrium is produced by the resistance on the body, and the impulse of the wind on the sails, the inclination of the wind on the sail and its effective impulse will be continually reduced. Nor could this rule, in all cases, in practice, be strictly adhered to; since, in square-rigged vessels, when the wind is more than a point abaft the

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* The shrouds, stays, and other causes connected with the rigging, will seldom allow the yards of square-rigged vessels to be braced sufficiently sharp.

beam, with these angles, the after sails would lessen the effect on the head sails, and make it necessary to brace the after yards sharper up than the head yards; but when the wind is a-beam, or before the beam, the whole of the yards may be braced to an angle which produces the best effect, which will be more easily observed, and found to answer nearly when the angle of the wind on the sails is from a point and a half to two points more open than that formed by the yards and the line of the keel.

102. When close-hauled, experience has shown, that the yards in square-rigged vessels can seldom be braced sufficiently sharp, to obtain the most advantageous disposition for plying to windward; this may be seen by comparing them with the angles made by the sails, and the line of the keel, of a fore and aft-rigged vessel, in which the angles will seldom exceed, on a wind, more than from 13° to 17°; * and which has been proved by the observations made on the experimental ships, under the command of Sir Thomas Hardy.† By having recourse, in one of these ships, to such measures as would allow the yards to be braced sharper up than in the others, the ship with the least relative length obtained the greatest advantage in going to windward; and though there may be circumstances, connected with the form of the body, which may conduce to this quality, independent of the comparative length and breadth; yet, from the general form of these ships, there is no good ground to justify any other conclusion, than that the principal advantage was obtained by the acute bracing of her yards. This will be more evident when we observe, that in some of the ships of this squadron, which possessed this quality in an eminent degree, from their length and their superior form, they seldom, by bracing their main-yard from 23° to 29°, and their fore-yards from 26° to 30°, could lie within 5½ points of the wind; while the short ship, by bracing her main-yard from 17° to 21°, and fore-yard from 25° to 28°, could sometimes lie within 5 points of the wind, and constantly gain to windward. The difference we find in the angle to which the yards are braced, as affecting the trim of the sails, would account, in some degree, for the difference of the superiority of ships in different trials, and would show the necessity of some methods being taken to ascertain the angle to which they are braced, and of using such means as would allow the yards to be braced sharper, or to the angle that experience should determine to be best for the ship.

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* Experienced cutter-sailers, commonly keep their boom when close-hauled to an angle with the line of the keel, in light breezes 13°, moderate breezes 15°, and in strong breezes 17°; the gaff will be more open than the boom from 2° to 4°.

† This was a trial made in 1827, on the relative qualities of the Sapphire, Challenger, and Tyne, of 28 guns, and Acorn, Satellite, Wolf, and Columbine, of 18 guns.—See Papers on Naval Architecture, Vol. II., Art. 8.

103. The Tables following are given by Euler for ships when close-hauled; and those when the ship is sailing large, with all the sails drawing, by Bouguer. Of the ships before alluded to, those which answered best had their fore-yards, when the wind was a-beam, braced to about 44°, and their main-yards to about 42°, with a fore and aft line; and when the wind was a point or two abaft the beam, the fore-yard was about 52°, and the main-yard about 48°. This agrees very nearly with the results determined by Don Juan, who, when the greatest proportion of sail is set, gives 50° 11′; he, however, increases the angle, when the sail becomes reduced, to 56° 21′;* and when the ship is close-hauled, with all sail set, the angle then made with the yard and line of the keel should be 28° 47′.

From Bouguer, when sailing large, and all the sails are drawing.			Relative length and breadth.	From Euler, when close-hauled.			
Apparent angle of the wind and course.	Angle of the sails and a fore and aft line.	Apparent angle of the sails and wind.		Angle of the wind and line of course.	Angle of the sail with a fore and aft line.	Angle of lee way with a fore and aft line.	Angle of wind and sail.
103° 53′	42° 30′	61° 23′	Least	67° 30′	21° 0′	23° 15′	22° 30′
99 13	40 0	59 13	Relative length.	65 0	21 0	19 15	25 0
94 25	37 30	56 55		63 15	21 0	16 0	26 45
89 28	35 0	54 28		62 0	20 45	13 15	28 0
84 23	32 30	51 53		61 15	20 30	12 0	28 45
70 06	30 0	49 06		60 30	20 30	10 30	29 30
73 39	27 30	46 09	Greatest	60 15	20 30	10 0	29 45
68 0	25 0	43 0	Relative length.				

104. In dividing the angles for properly bracing the yards, considerable error may be made in obtaining the real direction of the wind; since the vanes, when the body is in motion, only give the apparent direction, which will always be a-head of its real direction, and the true direction of the wind can be obtained only by tacking the ship, and taking the angle that the vane makes, with a fore and aft line on both tacks, when the body has the same velocity, and taking the mean of the two angles for the real direction. But as this method would be attended with some inconvenience, and is not always practicable, the following Tables are given, which show nearly, under different winds and different rates of sailing, the variation that takes place.

105. In the following Tables, which show what the vane is brought a-head of the real wind, the lee-way is not taken into account, which will bring it still more a-head, in proportion as it is increased.

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* Tracté de Méchanique, appliqué à la Construction et à la Manœuvre des Vaisseaux et autres bâtiments; par Don Georges Juan, French Translation.—Tom. 2, Lib. 4, Chap. 2, Art. 363.

WIND AT 5 POINTS OR 56° 15′.

VELOCITY OF SHIP.

	Velocity of Wind	1	2	3	4	5	6	7	8	9	10	11	12
Light Airs	1	28° 7′	38°13′										
	2	18 1	28 7										
	3	13 10	22 1	28° 7′									
Light Winds	4	10 21	18 1	23 45	28° 7′								
	5	8 31	15 13	20 31	24 44	28° 7′							
Light Breeze	6	7 14	12 56	18 1	22 1	25 21	28° 7′						
	7	6 18	11 35	16 3	19 50	23 2	25 45	28° 7′					
Moder. Breeze	8	5 33	10 20	14 28	18 1	21 6	23 45	26 5	28° 7′				
	9	4 58	9 20	13 10	16 33	19 26	22 1	24 18	26 19	28° 7′			
Fresh Breeze	10	4 30	8 30	12 4	15 13	18 1	23 31	22 44	24 44	26 30	28° 7′		
	12	3 47	7 14	10 20	13 10	15 44	18 1	20 7	22 1	23 45	25 21	26°47′	28° 7′
	14	3 16	6 18	9 3	11 35	13 55	16 3	18 1	19 50	21 30	23 2	24 27	25 45
Strong Breeze	16	2 53	5 33	8 2	10 21	12 29	14 28	16 19	18 1	19 37	21 6	22 28	23 45
	18	2 37	4 59	7 13	9 22	11 19	13 10	14 56	16 33	18 1	19 26	20 46	22 1
	20	2 19	4 30	6 34	8 31	10 21	12 4	13 41	15 15	16 40	18 1	19 18	20 13
Moder. Gale	22	2 7	4 7	6 1	7 49	9 45	11 8	12 40	14 7	15 29	16 48	18 1	19 11
	24	1 58	3 47	5 33	7 14	8 49	10 21	11 47	13 10	14 25	15 43	16 54	18 1
Fresh Gale	26	1 48	3 30	5 9	6 43	8 13	9 39	11 1	11 57	13 34	14 46	15 54	16 59
	28	1 40	3 16	4 48	6 18	7 42	9 3	10 21	11 35	12 47	13 55	15 0	16 3
	30	1 35	3 4	4 30	5 53	7 14	8 31	9 45	10 56	12 4	13 10	14 13	15 13
Strong Gale	32	1 28	2 53	4 14	5 33	6 47	8 2	9 12	10 21	11 26	12 29	13 29	14 38
	34	1 23	2 43	4 0	5 15	6 27	7 37	8 44	10 4	10 52	11 52	12 51	13 47
	36	1 18	2 37	3 47	4 58	6 7	7 14	8 18	9 21	10 21	11 21	12 15	13 10
Heavy Gale	38	1 14	2 26	3 35	4 35	5 49	7 14	7 54	8 54	9 44	10 48	11 43	12 35
	40	1 11	2 19	3 25	4 30	5 33	6 34	7 33	8 31	9 26	10 21	11 13	12 4

WIND AT 6 POINTS OR 67° 30′.

VELOCITY OF SHIP.

	Velocity of Wind	1	2	3	4	5	6	7	8	9	10	11	12
Light Airs	1	33°45′											
	2	21 11	33°45′										
	3	15 16	26 8	33°45′									
Light Winds	4	11 54	21 11	28 18	33°45′								
	5	9 44	17 46	24 16	29 30	33°45′							
Light Breeze	6	8 14	15 16	21 11	26 8	30 17	33°45′						
	7	7 7	13 23	18 47	23 25	27 24	30 48	33°45′					
Moder. Breeze	8	6 17	11 54	16 51	21 11	24 59	28 18	31 12	33°45′				
	9	5 37	10 43	15 16	19 15	22 56	26 8	28 58	31 30	33°45′			
Fresh Breeze	10	5 5	9 44	13 58	17 46	21 11	24 16	27 1	29 30	31 44	33°45′		
	12	4 16	8 14	11 54	15 16	18 22	21 11	23 46	26 8	28 18	30 17	32° 5′	33°45′
	14	3 40	7 7	10 22	13 23	16 11	18 47	21 11	23 25	25 34	27 24	29 10	30 48
Strong Breeze	16	3 13	6 17	9 11	11 54	14 28	16 51	19 6	21 11	23 8	24 59	26 36	28 18
	18	2 55	5 37	8 14	10 43	13 4	15 16	17 22	19 15	21 11	22 56	24 35	26 8
	20	2 29	5 5	7 28	9 44	11 54	13 58	15 55	17 46	19 32	21 11	22 46	24 16
Moder. Gale	22	2 22	4 38	6 50	8 56	10 56	12 51	14 42	16 26	18 6	19 40	21 11	23 3
	24	2 10	4 16	6 17	8 14	10 6	11 54	13 38	15 16	16 51	18 22	19 56	21 11
Fresh Gale	26	2 0	3 57	5 50	7 39	9 24	11 5	12 43	14 16	15 46	17 12	18 36	19 55
	28	1 52	3 40	5 36	7 7	8 47	10 22	11 54	13 23	14 49	16 11	17 31	18 47
	30	1 45	3 26	5 5	6 41	8 14	9 44	11 11	12 36	13 58	15 16	16 33	17 46
Strong Gale	32	1 38	3 13	4 47	6 17	7 45	9 11	10 34	11 54	13 12	14 28	15 41	16 51
	34	1 32	3 2	4 30	5 56	7 20	8 41	10 0	11 16	12 31	13 43	14 54	16 8
	36	1 27	2 55	4 16	5 37	6 57	8 14	9 29	10 43	11 54	13 4	14 11	15 16
Heavy Gale	38	1 23	2 43	4 3	5 20	6 36	7 50	9 2	10 12	11 20	12 27	13 32	14 28
	40	1 18	2 29	3 51	5 5	6 17	7 28	8 37	9 44	10 50	11 54	12 58	13 58

WIND AT 7 POINTS OR 78° 45′

VELOCITY OF SHIP.

	Velocity of Wind	1	2	3	4	5	6	7	8	9	10	11	12
Light Airs	1	39°26′											
	2	24 4	39°26′										
	3	17 1	30 3	39°26′									
Light Winds	4	13 9	24 4	32 41	39°26′								
	5	10 41	19 0	27 47	34 10	39°26′							
Light Breeze	6	9 0	17 1	24 4	30 3	36 1	39°26′						
	7	7 46	14 52	21 12	26 45	31 35	35 45	39°26′					
Moder. Breeze	8	6 49	13 9	20 27	24 4	28 39	32 41	36 15	39°26′				
	9	6 5	11 48	17 1	21 51	26 11	30 3	33 31	36 36	39°26′			
Fresh Breeze	10	5 29	10 41	15 32	19 0	24 4	27 47	31 10	34 10	36 54	39°26′		
	12	4 36	9 0	13 9	17 1	20 42	24 4	27 11	30 3	32 41	36 1	37°20′	39°26′
	14	3 57	7 46	11 24	14 52	18 8	21 12	24 4	26 45	29 16	31 35	33 45	35 47
Strong Breeze	16	3 28	6 49	10 1	13 9	16 7	20 27	21 33	24 4	26 26	28 39	30 44	32 41
	18	3 5	6 5	9 0	11 48	14 29	17 1	19 31	21 51	24 4	26 11	28 10	30 3
	20	2 47	5 29	8 8	10 41	13 9	15 32	17 49	19 0	22 5	24 4	25 58	27 47
Moder. Gale	22	2 30	5 0	7 26	9 46	12 3	14 15	16 23	18 25	20 23	22 16	24 4	25 48
	24	2 19	4 36	6 49	9 0	11 7	13 9	15 8	17 1	18 55	20 42	22 55	24 4
Fresh Gale	26	2 9	4 15	6 19	8 20	10 30	12 13	14 5	15 53	17 39	19 20	20 58	22 33
	28	1 59	3 57	5 52	7 46	9 36	11 21	13 9	14 52	16 31	18 8	19 41	21 12
	30	1 52	3 41	5 29	7 16	9 0	10 41	12 21	13 57	15 32	17 1	18 33	20 27
Strong Gale	32	1 45	3 28	5 9	6 49	8 28	10 1	11 37	13 9	14 39	16 7	17 32	19 0
	34	1 36	3 16	4 52	6 26	7 59	9 30	11 4	12 26	13 52	15 10	16 37	17 57
	36	1 33	3 5	4 36	6 5	7 33	9 0	10 52	11 48	13 9	14 29	15 48	17 1
Heavy Gale	38	1 28	2 55	4 20	5 46	7 19	8 33	9 54	11 13	12 31	13 47	15 3	16 16
	40	1 24	2 47	4 9	5 29	6 49	8 8	9 25	10 41	11 56	13 9	14 21	15 32

WIND AT 8 POINTS OR 90°.

VELOCITY OF SHIP.

	Velocity of Wind	1	2	3	4	5	6	7	8	9	10	11	12
Light Airs	1	45° 0′											
	2	26 33	45° 0′										
	3	18 26	33 41	45° 0′									
Light Winds	4	14 2	26 33	36 52	45° 0′								
	5	11 9	21 48	30 58	38 41	45° 0′							
Light Breeze	6	9 28	18 26	26 33	33 41	39 48	45° 0′						
	7	8 8	15 57	23 12	29 45	35 32	40 36	45° 0′					
Moder. Breeze	8	7 7	14 2	20 33	26 33	32 0	36 52	41 16	45° 0′				
	9	6 21	12 32	18 26	23 58	29 3	33 41	37 52	41 38	45° 0′			
Fresh Breeze	10	5 43	11 19	16 42	21 48	26 33	30 58	35 0	38 40	42 0	45° 0′		
	12	4 46	9 28	14 2	18 26	23 2	26 33	30 16	33 41	26 52	39 48	42°30′	45° 0′
	14	4 5	8 8	12 6	15 57	19 39	23 12	26 33	29 45	32 44	35 32	38 9	40 36
Strong Breeze	16	3 35	7 7	10 37	14 2	17 21	20 33	23 38	26 33	29 21	32 0	34 31	36 52
	18	3 10	6 21	9 28	12 32	15 31	18 26	21 15	23 58	26 33	29 3	31 26	33 41
	20	2 51	5 43	8 32	11 19	14 2	16 42	19 17	21 48	24 14	26 33	28 49	30 58
Moder. Gale	22	2 36	5 11	7 46	10 22	12 48	15 32	17 39	20 44	23 18	24 27	26 33	28 37
	24	2 23	4 46	7 7	9 28	11 46	14 2	16 16	18 26	20 33	23 2	24 37	26 33
Fresh Gale	26	2 12	4 24	6 35	8 48	10 53	13 10	15 4	17 36	19 45	21 2	22 56	24 46
	28	2 3	4 5	6 7	8 8	10 7	12 14	14 2	15 57	18 21	19 39	21 27	23 12
	30	1 55	3 47	3 43	7 34	9 28	11 19	13 8	15 8	17 9	18 26	20 7	21 48
Strong Gale	32	1 47	3 35	5 21	7 7	8 53	10 42	12 2	14 2	16 3	17 21	18 58	20 33
	34	1 41	3 22	5 3	6 44	8 32	10 6	11 38	13 28	15 9	16 24	17 53	19 25
	36	1 35	3 10	4 46	6 21	7 54	9 28	11 0	12 32	14 2	15 31	16 59	18 26
Heavy Gale	38	1 31	3 1	4 34	6 2	7 36	9 8	10 26	12 4	13 12	14 45	16 8	17 31
	40	1 26	2 51	4 18	5 43	7 7	8 36	9 56	11 19	12 54	14 2	15 23	16 24

PROPORTIONS FOR MASTS, YARDS, ETC.

ON MASTING BOATS.

106. In determining the lengths of masts &c., for boats, the relative proportions of the areas of their different sails is of little use, as boats are soon affected by an alteration of the stowage, &c.; there is also a great difference in the moments of sails of boats of the same size, and this frequently happens when they are similarly rigged, and employed for the same purposes. In the following TABLES, therefore, the limits are taken from the greatest and smallest sails of those boats that are best rigged, and most fully approved of; and they give the same moment of sail, nearly, for every *kind of rigging*.

107. The sails of boats are subject to the same rules for placing the centre of effort, as those of vessels of the largest magnitude; but as the effect of the wind on a boat's sails is very considerable, in comparison with its stability, and as they can be more easily taken in, the centre of effort must be so situated, that the boat may have a strong tendency to fly up in the wind, and so diminish its effect on the sails. It is, however, of little importance, that the form of the boat should be such as would ensure their being ardent, since the quality of being ardent may be so easily procured, by varying the position of the stowage or sitters.

108. The proportions in the following Tables, for the sizes of the sails in relation to the masts, yards, &c., are all taken as they were actually found in boats considered to be properly rigged, and with well-proportioned sails; but those in general given are, for *sprit-sails,* for the fore leech 12 inches less than the depth from the shive at the mast-head to the gunwale, with one or two gore cloths; or for the foot to have a proper spread for the sheet and head, to be for the fore .88, and for the main .8 of the foot, with each cloth gored from 12 to 14 inches. The head of the mizen has seldom more than a gore of 11 inches to each cloth, and the depth of the fore leech from the shive, is so much that it will only just clear the gunwale. In *lug-sails,* the head spreads the yard to about 4 inches of the cleats, and has about a 6-inch gore to each cloth; the fore leech has two or three gored cloths, and is generally $\frac{2}{3}$ the length of the after leech; the foot is gored to have a small sweep. *Settee-sails* spread the yard to about 6 inches of the cleats; the leech is commonly $\frac{5}{6}$ of the head, and the luff $\frac{1}{5}$ of the leech, or to the reef with the first cloth gored to the nock. *Lateen-sails* have the same spread in relation to the yard as settees; the heads of these sails commonly gore the breadth of the cloth, and the foot is cut square. The hoist of most sails for the main and fore are, at the mast, 12 inches less than the depth from the shive to the gunwale. Jibs have in general the leech 12 inches less than the depth from the shive to the gunwale, and the foot to spread the distance from the shive in the bowsprit or stem, to the mast.

TABLES: Showing the Maximum and Minimum of Proportions given for Masts, Sails, &c. of Boats differently rigged, with the Moments and Areas of Sail, and the Position of the Masts. (PLATE II.)

DIMENSIONS OF BOATS.	KNOWN QUANTITIES.	DIMENSIONS OF MASTS AND GEAR IN TERMS OF KNOWN QUANTITIES.							
Length .... 32 feet. Breadth.......... 8.5 do		BOATS RIGGED WITH THREE TRIANGULAR SAILS.				BOATS RIGGED WITH THREE LUG-SAILS.			
		Sliding Gunter. Fig. 24.		Lateen or Settee. Fig. 25.		Square at the Head. Fig. 26.		Narrow at the Head. Fig. 27.	
SPECIES OF MASTS AND GEAR.		Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.
		No. dec.	Length. ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length. ft. dec.
Main-mast	Breadth .... ×	2.2	18.7	2.15	18.3	2.4	20.4	2.7	22.8
Fore-mast	Main-mast .... ×	.93	17.5	.8	14.6	.92	18.8	.9	20.5
Mizen-mast	Ditto .... ×	.53	10.0	.43	8.0	.6	12.2	.6	13.6
Main-yard	Length.............. ×	—	—	.83	26.5	.5	16.0	.38	12.2
Fore-yard	Main-yard .... ×	—	—	.95	25.0	.9	14.4	.86	10.5
Mizen-yard..............	Ditto .... ×	—	—	.56	15.0	.63	10.2	.55	6.7
Main-slide	Main-mast .... ×	1.	18.5	—	—	—	—	—	—
Fore-slide	Fore-mast .... ×	1.	17.5	—	—	—	—	—	—
Mizen-slide	Mizen-mast .... ×	1.	10.0	—	—	—	—	—	—
Bowsprit	Length.............. ×	.25	8.0	—	—	—	—	.28	9.0
Outrigger	Ditto .... ×	.34	11.0	.380	12.2	.4	12.8	.34	11.0
Main-mast from the middle	Ditto .... ×	.053	before 1.7	.037	abaft. 1.2	.034	before 1.0	.015	abaft .5
Fore do. do.	Ditto .... ×	.328	before 10.5	.312	before 10.0	.287	before 9.2	.281	before 9.1
Mizen do. do.	as the transom......	—	—	—	—	—	—	—	—
Main-mast to rake........	In a foot................	—	1½ in.	—	—	—	—	—	1 in.
Fore do. do.	Ditto	—	1	—	—	—	—	—	½
Mizen do. do.	as the transom......	—	—	—	—	—	—	—	—

Size and Positions of the Sails.

SPECIES OF SAILS.	BOATS RIGGED WITH THREE TRIANGULAR SAILS.										BOATS RIGGED WITH THREE LUG-SAILS.									
	Sliding Gunter.					Lateen.					Square at the Head.					Narrow at the Head.				
	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	mast or bend	leech	area	head or bend	foot	luff	leech	area	head	foot	luff	leech	area	head	foot	luff	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib		7.9	stay 15.2	12.3	47	....	....	....	....	....	....	....	....	....	....	....	8.6	stay 17.6	13.7	55
Fore-sail		14.2	24.4	26.8	169	24.2	20.6	4.0	21.0	240	13.7	15.7	13.5	16.6	215	9.8	15.6	14.6	17.9	194
Main		15.0	26.9	27.6	193	25.6	20.6	4.6	22.2	254	15.2	17.3	14.8	17.9	262	11.0	17.0	16.8	20.8	252
Mizen		9.0	14.2	15.0	61	14.0	10.4	2.6	12.1	76	9.5	10.3	10.3	12.1	108	5.8	8.6	10.5	12.8	74

SPECIES OF SAILS.	Sliding Gunter. In relation to the water-line			In relation to the middle of the length				Lateen. In relation to the water-line			In relation to the middle of the length				Square at the Head. In relation to the water-line			In relation to the middle of the length				Narrow at the Head. In relation to the water-line			In relation to the middle of the length			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib	47	× 7.5	= 353	47	× 13.5	= 634	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55	× 8.1	= 445	55	× 16.7	= 919	..
Fore-sail	169	× 11.2	= 1893	169	× 5.2	= 879	..	240	× 10.7	= 2568	240	× 3.7	= 888	..	215	× 10.9	= 2344	215	× 5.9	= 1269	..	194	× 10.9	= 2115	194	× 6.5	= 1241	..
Main	193	× 12.1	= 2335	193	× 4.5	=	868	254	× 11.1	= 2819	251	× 6.3	=	1600	262	× 11.4	= 2987	262	× 2.7	=	707	252	× 12.2	= 3074	252	× 3.6	=	907
Mizen	61	× 8.1	= 494	61	× 19.6	=	1196	76	× 7.75	= 589	76	× 21.4	=	1626	108	× 9.4	= 1015	108	× 19.5	=	2106	74	× 8.7	= 644	74	× 18.9	=	1399
TOTAL	470		5075	470		1513	2064	570		5976	570		888	3226	585		6346	585		1269	2813	575		6278	575		2160	2306
Centre of effort above water-line	5075/470 = 10.8 height.							5976/570 = 10.48 height.							6346/585 = 10.84 height.							6278/575 = 10.97 height.						
.... from middle	(2064—1513)/470 = 1.17 abaft.							(3226—888)/570 = 4.1 abaft.							(2813—1269)/585 = 2.64 abaft.							(2306—2160)/575 = .25 abaft.						

Dimensions, &c. of Masts and Gear.

DIMENSIONS OF BOAT.		DIMENSIONS IN TERMS OF KNOWN QUANTITIES.							
Length .... 32 feet. Breadth .... 8.5 do.	KNOWN QUANTITIES.	RIGGED AS COMMON SCHOONERS. Fig. 28.				RIGGED AS BERMUDA SCHOONERS. Fig. 29.			
		Minimum.		Maximum.		Mininum.		Maximum.	
SPECIES OF MASTS AND GEAR.		Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.
		No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.
Main-mast hounded	Breadth of boat ...... ×	2.23	18.9	2.7	22.9	2.72	23.0	3.1	26.3
Ditto pole	Main-mast hounded .. ×	.23	4.3	.23	5.2	.15	3.4	.15	3.9
Fore-mast hounded	Main-mast hounded .. ×	.97	18.3	.97	22.2	.92	21.2	.92	24.1
Ditto pole	Fore-mast hounded.... ×	.23	4.2	.23	5.1	.15	3.1	.15	3.6
Main-gaff	Length of boat ...... ×	.34	10.9	.37	11.8	.25	8.0	.26	8.3
Fore-gaff................	Main-gaff............ ×	.9	9.8	.9	10.6	.92	7.4	.92	7.6
Main-boom..............	Length of boat ...... ×	.56	17.92	.6	19.2	.54	17.3	.6	19.2
Bowsprit................	Ditto .... ×	.3	9.6	.34	10.9	.4	12.8	.43	13.8
Main-mast from the middle	Ditto .... ×	.032	abaft 1.0	.032	abaft 1.0	.031	before 1.0	.031	before 1.0
Fore-mast	Ditto .... ×	.34	before 10.8	.34	before 10.8	.343	11.0	.343	11.0
Main-mast to rake........	Aft in a foot	—	2	—	2 in	—	4 in.	—	4 in.
Fore-mast ditto........	Ditto ditto	—	1	—	1	—	2	—	2

Size and Positions of the Sails.

SPECIES OF SAILS.	RIGGED AS COMMON SCHOONERS.										RIGGED AS BERMUDA SCHOONERS.									
	Minimum.					Maximum.					Minimum.					Maximum.				
	Dimensions.				Surface.	Dimensions.				Surface.	Dimensions.				Surface.	Dimensions.				Surface.
	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib.	....	9.2	16.8	12.7	58	....	10.6	19.5	15.	78	....	11.0	stay 20.5	13.7	71	....	14.5	stay 26.0	18.4	132
Fore-sail	9.1	15.2	13.6	15.0	191	10.0	16.1	15.7	21.5	221	6.9	14.2	16,2	18.2	165	7.0	14.6	19.8	21.0	205
Main-sail	10.2	17.4	14.0	17.3	211	11.2	18.4	16.2	21.8	280	7.5	15.9	18.0	19.6	205	7.7	17.7	21.5	22.0	257

SPECIES OF SAILS.	RIGGED AS COMMON SCHOONERS.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib.	58	× 7.8	= 374	58	×14.8	= 754	....	78	× 8.5	= 684	78	×15.2	=1117	....
Fore-sail	191	×10.2	=1948	191	× 4.5	= 859	....	221	×11.5	=2541	221	× 4.4	= 972	....
Main-sail	211	×10.8	=2278	211	× 9.2	=	1941	280	×11.9	=3332	280	×10.1	=	2828
TOTAL	460		4600	460		1613	1941	579		6557	579		2089	2828
Ht. of centre of effort	$\frac{4600}{460}$ = 10 height above water-line.							$\frac{6557}{579}$ = 11.3 height above water-line.						
Dist. of cent. of effort from middle	$\frac{1941-1613}{460}$ = .7 abaft.							$\frac{2828-2089}{572}$ =1.2 abaft.						

SPECIES OF SAILS.	RIGGED AS BERMUDA SCHOONERS.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib.	94	× 7.5	= 705	94	×15.0	=1410	....	132	× 9.1	=1201	132	×14.7	=1940	....
Fore-sail	165	×10.2	=1683	165	× 4.0	= 661	....	205	×12.0	=2460	205	× 3.2	= 650	....
Main-sail	205	×11.9	=2439	205	× 8.6	=	1763	257	×12.6	=3238	257	× 9.0	=	2313
TOTAL	464		4827	464		2071	1763	594		6899	594		2590	2313
Ht. of centre of effort	$\frac{4827}{464}$ = 10.4 height above water-line.							$\frac{6899}{594}$ = 11.6 height above water-line.						
Dist. of cent. of effort from middle	$\frac{2071-1763}{464}$ = .66 before the middle.							$\frac{2590-2313}{594}$ =.47 before the middle.						

Dimensions &c. of Masts and Gear.

DIMENSIONS OF BOAT.	KNOWN QUANTITIES.		DIMENSIONS IN TERMS OF KNOWN QUANTITIES.							
Length ...... 32 feet. Breadth ......8.5 do.			BOATS RIGGED WITH THREE LUG-SAILS AND A JIB. (Fig. 30.)				BOATS RIGGED AS XEBECS WITH THREE LATEEN SAILS. (Fig. 31.)			
SPECIES OF MASTS AND GEAR.			Minimum.		Maximum.		Minimum.		Maximum.	
			Proportions.	Dimensions.	Proportions.	Dimensions.	Proportions.	Dimensions.	Proportions.	Dimensions.
			No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.
Main-mast	Breadth of boat	×	2.3	19.5	2.7	23.0	1.4	11.9	1.76	15.0
Fore-mast	Main-mast	×	.9	17.5	.9	20.7	.98	11.7	.98	14.7
Mizen-mast	Ditto	×	.6	11.7	.6	13.8	.67	8.0	.67	10.0
Main-yard	Length of boat	×	.375	12 0	.4	12.8	.9	28.8	1.06	33.9
Fore yard	Main-yard	×	.9	10 8	.9	11.5	.8	23 0	.9	30.5
Mizen-yard	Ditto	×	.7	8.4	.7	9.0	.5	14 4	.53	18.0
Boomkin	Length of boat	×	.4	12.8	.43	13.7	.187	6.0	.25	8.0
Bowsprit	Ditto	×	.4	13.1	.44	14.0	—	—	—	—
Outrigger	Ditto	×	.4	12.8	.4	12 8	.312	10.0	.343	11.0
Main-mast before the middle	Ditto	×	.025	0.8	.025	.8	.018	.6	.018	.6
Fore-mast ditto ditto	......	×	.34	10.9	3 4	10.9	.37	11.8	.37	11 8
				aft	—	aft	—	forward	—	forward.
Fore-mast to rake	Aft in a foot	×	—	½ in	—	½ in.	—	3½ in.	—	3½ in.
Main-mast ditto	Ditto	×	—	2 in	—	2 in.	—	—	—	—
Mizen-mast	As the transom	×	—							

Size and Positions of the Sails.

SPECIES OF SAILS.	BOATS RIGGED WITH THREE LUG-SAILS AND A JIB.										BOATS RIGGED AS XEBECS, WITH THREE LATEEN SAILS.									
	Minimum.					Maximum.					Minimum.					Maximum.				
	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	luff	leech	area	head	foot	luff	leech	area	head	foot	bend	leech	area	head	foot	bend	leech	area
	ft.	ft.	ft.	ft.	sq. ft	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq ft.	ft.	ft.	ft.	ft	sq. ft.
Jib............	...	11 6	stay 16.2	10.6	68	....	13.4	stay 19.0	12.4	85	....	....	....	....	....	....	....	....	....	....
Fore-sail	10 2	15.0	12.0	14.8	166	10.8	16.0	16.2	18.5	218	....	16.5	24.0	19.0	158	....	20.0	29.6	23.0	236
Main..........	11 4	16.0	14.6	16.4	204	12.0	18.0	18.0	20.5	262	....	17.5	27.8	21.5	184	....	21.0	33 0	25.5	264
Mizen	7.9	10.4	9.0	10.8	90	8.4	11.5	11.0	13.0	112	....	9.5	13.4	10 5	49	....	12.0	17.0	13.5	81

SPECIES OF SAILS.	BOATS RIGGED WITH THREE LUG-SAILS AND A JIB.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib....	68	× 6.6	= 448	68	× 16.	=1088	....	85	× 7.5	= 637	85	× 16.6	=1411	....
Fore-sail	166	× 6.8	=1128	166	× 7.	=1162	....	218	× 10.4	=2267	218	× 6.5	=1417	....
Main	204	× 9.8	=1999	204	× 5.2	=	1060	262	× 11.5	=3013	262	× 6.2	=	1624
Mizen	90	× 7.3	= 657	90	× 19.6	=	1764	112	× 8.2	= 918	112	× 19.8	=	2217
TOTAL	528		4232	528		2250	2824	677		6835	677		2828	3841
Centre of effort above water-line	$\frac{4232}{528}$ = 8.01 height.							$\frac{6835}{677}$ = 10.09 height.						
.... from middle	$\frac{2824-2250}{528}$ = 1.08 abaft.							$\frac{3841-2828}{677}$ = 1.4 abaft.						

SPECIES OF SAILS.	BOATS RIGGED AS XEBECS, WITH THREE LATEEN SAILS.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib....	..	....	....	..	....	....	....	....	....	....	....	....	....	....
Fore-sail	158	× 10.2	=2611	158	× 8.8	=1364	....	236	× 11.6	=2737	236	× 9.0	=2124	....
Main	184	× 11.0	=1024	184	× 5.2	=	956	264	× 12.0	=3168	264	× 5.8	=	1531
Mizen	49	× 6.5	= 318	49	× 19.2	=	940	81	× 7.5	= 507	81	× 19.3	=	1563
TOTAL	391		3953	391		1364	1896	581		6412	581		2124	3094
Centre of effort above water-line	$\frac{3953}{391}$ = 9.1 height.							$\frac{6412}{581}$ = 11 height.						
.... from middle	$\frac{1896-1364}{391}$ = 1.3 abaft.							$\frac{3094-2124}{581}$ = 1.6 abaft.						

Dimensions, &c. of Masts and Gear.

DIMENSIONS OF BOAT.	KNOWN QUANTITIES.	DIMENSIONS OF MASTS AND GEAR IN TERMS OF KNOWN QUANTITIES.							
Length .... 32 feet. Breadth .... 8.5 do.		BOATS RIGGED WITH THREE SPRIT-SAILS AND A JIB. (Fig. 32.)				BOATS RIGGED WITH THREE SLIDING GUNTERS AND A JIB. (Fig. 33.)			
SPECIES OF MASTS AND GEAR.		Minimum.		Maximum.		Minimum.		Maximum.	
		Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.
		No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.
Main-mast	Breadth of boat ...... ×	2.4	20.4	2.7	22.9	2.0	17.0	2.46	20.9
Fore-mast	Main-mast .... ×	.92	18.8	.9	20.6	.9	15.3	.9	18.8
Mizen-mast	Ditto ditto ...... ×	.6	12.2	.6	13.7	.54	9.2	.54	11.3
Main-sprit	Ditto ditto ...... ×	.9	18.3	.9	20.7	1.0	17.0	1.0	20.9
Fore-sprit	Fore-mast .... ×	.9	16.9	.9	18.6	1.0	15.3	1.0	18.8
Mizen-sprit..............	Mizen-mast .... ×	.89	10.9	.89	12.4	1.0	9.2	1.0	11.3
Bowsprit..............	Length of boat ...... ×	.4	12.8	.44	14.0	.4	12.8	.43	13.8
Outrigger	Ditto ditto ...... ×	.41	13.1	.43	13.7	.28	9.0	.34	10.9
Main-mast from the middle	Ditto ditto ...... ×	before .066	2.0	before .066	2.0	.056	1.8	.056	1.8
Fore ditto ditto..........	Ditto ditto ...... ×	.33	10.6	.33	10.6	.343	11.0	.343	11.0
Main-mast to rake........	Aft in a foot	—	.2	—	.2	—	.2	—	.2
Fore ditto ditto..........	Ditto ditto	—	.1	—	.1	—	.1	—	.1
Mizen ditto ditto........	As the transom								

Size and Positions of the Sails.

BOATS RIGGED WITH THREE SPRIT-SAILS AND A JIB.

SPECIES OF SAILS.	Minimum.					Maximum.				
	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib..........	....	11.6	stay 16.2	10.6	68	....	13.4	stay 19.0	12.4	85
Fore-sail......	8.6	13.2	14.7	16.5	171	9.3	14.2	16.0	19.4	203
Main-sail......	10.3	14.0	16.4	17.6	203	10.3	14.8	18.5	23.3	240
Mizen-sail	5.2	10.4	9.8	10.9	84	5.7	11.5	11.1	12.5	97

SPECIES OF SAILS.	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib..........	68	× 6.6	448.8	68	× 16.0	= 1088	..	85	× 7.5	= 637	85	× 16.6	= 1411	..
Fore-sail	171	× 9.4	1607.4	171	× 4.5	= 769	..	203	× 10.7	= 2172	203	× 4.0	= 812	..
Main-sail......	203	× 10.8	2192.4	203	× 4.5	=	913	240	× 11.6	= 2784	210	× 4.8	=	1152
Mizen-sail	84	× 7.5	630.0	84	× 20.2	=	1696	97	× 7.8	= 756	97	× 20.7	=	2007
TOTAL.....	526		4878.6	526		1857	2609	625		6349	625		2223	3159
Ht. of centre of effort	$\frac{4878.6}{526} = 9.3$ height.							$\frac{6349}{625} = 10.1$ height.						
Dist. of cent. of effort from middle	$\frac{2609-1857}{526} = 1.4$ abaft.							$\frac{3159-2223}{625} = 1.4$ abaft.						

BOATS RIGGED WITH THREE SLIDING GUNTERS AND A JIB.

SPECIES OF SAILS.	Minimum.					Maximum.				
	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib..........	....	11.0	stay 18.0	12.0	63	....	12	stay 20.5	14	82
Fore-sail......	....	13.5	23.5	26.0	156	....	14	27.5	30	191
Main-sail......	....	15.0	26.0	27.5	187	....	15	30.8	31.6	221
Mizen-sail	....	7.3	14.5	15.0	52	....	8.7	17.4	17.7	74

SPECIES OF SAILS.	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib..........	63	× 7.	= 411	63	× 16.3	= 1026	..	8	× 7.8	= 639	82	× 16.5	= 1353	..
Fore-sail	156	× 10.6	= 1653	156	× 5.5	= 859	..	191	× 12.0	= 2292	191	× 5.2	= 993	..
Main-sail......	187	× 11.5	= 2150	187	× 5.4	=	1009	221	× 13.2	= 2917	221	× 5.7	=	1259
Mizen-sail	52	× 7.5	= 390	52	× 18.8	=	977	74	× 8.4	= 621	74	× 19.2	=	1420
TOTAL.....	458		4634	458		1884	1986	568		6469	568		2346	2679
Ht. of centre of effort	$\frac{4634}{458} = 10.1$ height.							$\frac{6469}{568} = 11.3$ height.						
Dist. of cent. of effort from middle	$\frac{1986-1884}{458} = .22$ abaft.							$\frac{2679-2346}{568} = .56$ abaft.						

Dimensions, &c. of Masts and Gear.

DIMENSIONS OF BOAT.	KNOWN QUANTITIES.		DIMENSIONS OF MASTS AND GEAR IN TERMS OF KNOWN QUANTITIES.							
Length .... 32 feet. Breadth .... 8.5 do.			BOATS RIGGED WITH FORE AND MIZEN-LUG WITH TACK TO THE MAST. (Fig. 34.)				BOATS RIGGED WITH FORE AND MIZEN-LUG. (Fig. 35.)			
SPECIES OF MASTS AND GEAR.			Minimum.		Maximum.		Minimum.		Maximum.	
			Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.
			No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.	No. dec.	Length ft. dec.
Fore-mast	Breadth	×	2.73	23.2	3.08	26.2	2.73	23.2	3.08	26.2
Mizen-mast	Fore-mast	×	.6	13.9	.6	15.7	.6	13.9	.6	15.7
Fore-yard	Length..............	×	.384	12.3	.4	12.8	.443	14.2	.5	16.0
Mizen-yard	Fore-yard............	×	.87	10.7	.87	11.2	.76	10.8	.76	12.1
Boomkin	Length..............	×	.42	13.4	.45	14.5	.42	13.4	.45	14.4
Fore-mast before middle ..	Length of boat	×	.359	11.5	.359	11.5	.359	11.5	.359	11.5
Mizen-mast	At the transom	×	—	—	—	—	—	—	—	—
Fore-mast to rake........	In a foot	×	—	2 in.	—	2 in.	—	1 in.	—	1 in.
Mizen-mast ditto	As transom	×	—	—	—	—	—	—	—	—
Bowsprit	Length..............	×	.4	12.8	.42	13.4	—	—	—	—
Outrigger	....	×	.42	13.4	.45	13.4	.42	13.4	.45	14.4

Size and Positions of the Sails.

SPECIES OF SAILS.	BOATS RIGGED WITH FORE AND MIZEN LUG, WITH TACK TO THE MAST.										BOATS RIGGED WITH FORE AND MIZEN LUG.									
	Minimum.					Maximum.					Minimum.					Maximum.				
	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	luff	leech	area	head	foot	luff	leech	area	head	foot	luff	leech	area	head	foot	luff	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib…………	….	11.5	stay 22.5	16.0	90	….	12.0	stay 26.0	19.5	117	….	….	….	….	….	….	….	….	….	….
Foresail ……	11.5	16.5	16.4	20.3	252	12.0	18.5	19.5	23.5	312	13 6	19.5	16.4	20.6	297	14.5	21.5	19.5	24.0	371
Mizen ………	9.8	10.6	11.0	10.8	122	10.2	11.2	11.5	13.4	132	9.8	10.6	11.0	10.8	122	10.2	11.2	11.5	13.4	132

SPECIES OF SAILS.	BOATS RIGGED WITH FORE AND MIZEN LUG, WITH TACK TO THE MAST.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib …………	90	× 8.	= 720	90	× 15.5	= 1395	….	117	× 9.	= 1053	117	× 15.2	= 1778	….
Fore-sail ……	252	× 11.5	= 2898	252	× 3.6	= 907	….	312	× 12.5	= 3900	312	× 2.6	= 811	….
Mizen ………	122	× 9.	= 1098	122	× 20.6	=	2513	132	× 9.	= 1188	132	× 20.9	=	2758
TOTAL ……	464		4716	464		2302	2513	561		6141	561		2589	2758
Centre of effort above water-line………	$\frac{4716}{464} = 10.\ 1$ height.							$\frac{6141}{561} = 10.\ 9$ height.						
…. from middle	$\frac{2513-2302}{464} = .4$ abaft.							$\frac{2758-2589}{561} = .3$ abaft.						

SPECIES OF SAILS.	BOATS RIGGED WITH FORE AND MIZEN LUG.													
	Minimum.							Maximum.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib …………	….	….	….	….	….	….	….	….	….	….	….	….	….	….
Fore-sail ……	297	× 12 9	= 3564	297	× 6.7	= 1989	….	371	× 13	= 4823	371	× 5.6	= 2079	….
Mizen ………	122	× 9.0	= 1098	122	× 20.6	=	2513	132	× 9	= 1188	132	× 20.9	=	2758
TOTAL ……	419		4662	419		1989	2513	503		6011	503		2079	2758
Centre of effort above water-line………	$\frac{4662}{419} = 11.1$ height.							$\frac{6011}{503} = 11.1$ height.						
…. from middle	$\frac{2513-1989}{419} = 1.2$ abaft.							$\frac{2758-2079}{503} = 1.\ 3$ abaft.						

TABLES: Showing the Proportions of the large and small Set of Sails, as usually given to Wherries, with the Proportion of the Masts, Sprits, &c., and Position of Masts.

WHERRIES RIGGED WITH FORE AND MIZEN-SPRIT AND JIB. (Fig. 36.)

DIMENSIONS OF BOAT.

	1st Exa.	2nd Exa.
Length	27 feet.	25 feet.
Breadth....	7.5	7 do.

SPECIES OF MASTS AND GEAR.	KNOWN QUANTITIES.	DIMENSIONS OF MASTS AND GEAR IN TERMS OF KNOWN QUANTITIES.							
		FIRST EXAMPLE.				SECOND EXAMPLE.			
		Small set.		Large set.		Small set.		Large set.	
		Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.	Proportns.	Dimensns.
		No. dec.	No. dec.	No. dec.	No. dec.	No. dec.	No. dec.	No. dec.	No. dec.
Fore-mast	Breadth	2.4	18.0	2.7	20.2	2 2	15.4	2.4	16.8
Mizen-mast	Fore-mast	.62	11.1	.6	12.1	.65	10.0	.65	11.0
Fore-sprit	Fore-mast	1.0	18.0	1.0	20.2	.95	14.9	.95	15.4
Mizen-sprit	Mizen-mast	.9	10.1	.95	11.4	.8	8.0	.8	9.0
Boom	Length	.26	7.0	.33	8.9	.224	5.6	.28	7.0
Bowsprit	Ditto	—	—	.3	8.1	—	—	.268	6.7
Fore-mast before the middle	Ditto	.215	5.8	.215	5.8	.2	5.0	.2	5.0
Mizen-mast abaft do.......	Ditto	.308	8.3	.308	8.3	.32	8.0	.32	8.0
Fore-mast to rake	In five feet	—	½ in.	—	½ in.	—	⅓ in.	—	⅓ in.
Mizen-mast do.	Ditto	—	1	—	1	—	1	—	—

Size and Positions of the Sails.

SPECIES OF SAILS.	FIRST EXAMPLE.										SECOND EXAMPLE.									
	Small Set.					Large Set.					Small Set.					Large Set.				
	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces	Dimensions.				Surfaces
	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area
	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.	ft.	ft.	ft.	ft.	sq. ft.
Jib…………	….	8.0	stay 15.	13.1	45	….	10.2	stay 16.0	12.9	66	….	6.4	stay 13.9	12.1	38	….	10.4	stay 16.0	12.2	64
Fore-sail ……	10.8	12.6	13.	18.6	172	11.7	13.7	14.2	20.1	204	7.6	9.6	10.0	14.8	109	8.2	10.3	11.9	15.8	121
Mizen ………	6.0	6.6	7.6	10.3	52	7.5	7.6	7.10	11.8	66	4.4	5.0	6.3	8.3	32	5.1	6.2	7.6	9.1	45

SPECIES OF SAILS.	FIRST EXAMPLE. Small Set.							FIRST EXAMPLE. Large Set.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib…………	45	× 7.6	= 345	45	× 9.0	= 405	….	66	× 7.4	= 485	66	× 10.3	= 675	….
Fore-sail ……	172	× 10.9	= 1876	172	× .25	= 43	….	204	× 11.5	= 2346	204	× .25	=	51
Mizen ………	52	× 7.8	= 407	52	× 11.2	=	582	66	× 8.1	= 541	66	× 11.7	=	777
TOTAL ……	269		2628	269		448	582	336		3372	336		675	828
Centre of effort above water-line………	$\frac{2628}{269} = 9.7$ height.							$\frac{3372}{336} = 10.03$ height.						
…. from middle	$\frac{582-448}{269} = .49$ abaft.							$\frac{828-675}{336} = .45$ abaft.						

SPECIES OF SAILS.	SECOND EXAMPLE. Small Set.							SECOND EXAMPLE. Large Set.						
	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line.			In relation to the middle of the length.			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib…………	38	× 6.9	= 261	38	× 8.0	= 303	….	64	× 7.	= 448	64	× 8.9	= 569	….
Fore-sail ……	109	× 9.3	= 1017	109	× .4	= 44	….	121	× 9.7	= 1177	121	× .1	= 12	….
Mizen ………	32	× 6.7	= 214	32	× 0.8	=	345	45	× 7.3	= 332	45	× 11.3	=	513
TOTAL ……	179		1492	179		347	345	230		1957	230		581	513
Centre of effort above water-line………	$\frac{1492}{179} = 8.32$ height.							$\frac{1957}{230} = 8.5$ height.						
…. from middle	$\frac{347-345}{179} = .01$ before.							$\frac{581-513}{230} = .30$ before.						

Boats rigged as Bermuda Schooners, with short Gaffs.—Plate II., fig. 37.

DIMENSIONS OF BOAT.	DIMENSIONS OF MASTS AND GEAR IN TERMS OF KNOWN QUANTITIES.					
Length 32 feet. Breadth 8.5 do.	Known Quantities.		Minimum.		Maximum.	
Species of Mast and Gear.			Proportions.	Dimensions.	Proportions.	Proportions.
				Length.		Length.
			No. dec.	No. dec.	No. dec.	No. dec.
Main-mast hounded	Breadth of boat	×	2.72	23.1	3.1 =	26.3
Ditto pole	Main-mast hounded	×	.15	3.4	.15	3.9
Fore-mast hounded	Main-mast	×	.95	21.9	.95	24.9
Ditto pole	Fore-mast hounded ..	×	.15	3.2	.15	3.7
Main-gaff	Length of boat......	×	.19	6.1	.2	6.4
Fore-gaff..........	Main-gaff	×	.9	5.5	.9	5.8
Main-boom........	Length of the boat ..	×	.56	17.9	.7	22.4
Bowsprit..........	Ditto	×	.4	12.8	.43	13.8
Main-mst. from mid.	Ditto	×	—	—	—	—
Fore ditto	Ditto	×	before .37	10.8	before .34	10.8
Main-mast to rake	Aft in a foot		—	2 in.	—	2 in.
Fore do. do.	Ditto		—	1	—	1
Area of load-wa. line						

SIZE AND POSITION OF SAILS.

	Minimum.					Maximum.				
	head	foot	mast or bend	leech	area	head	foot	mast or bend	leech	area
	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet
Jib	....	12.0	22.0	17.5	106	....	11.	19.	14.	79
Fore-sail	5.0	15.0	20.0	23.2	210	5.0	13.5	16.5	20.	152
Main-sail	5.6	21.0	21.2	26.5	283	5.6	17.0	17.0	22.5	228

	In relation to the water-line.			In relation to the middle of the length.				In relation to the water-line			In relation to the middle of the length			
	area	height of centre	moment	area	distance from middle	moment before	moment abaft	area	height of centre	moment	area	distance from middle	moment before	moment abaft
Jib	79	× 7.8	= 616	79	× 16.8	= 1327	....	106	× 8.8	= 932	106	× 17.0	= 1802	....
Fore-sail	152	× 11.0	= 1520	152	× 5.6	= 851	....	210	× 11.7	= 2457	210	× 5.0	= 1050	....
Main-sail	228	× 11.2	= 2553	228	× 7.0	=	= 1596	283	× 12.5	= 3537	283	× 7.5	=	2122
TOTAL......	459		4689	459		2178	1596	599		6926	599		2852	2122

Height of centre of effort above the water-line	$\frac{4689}{459} = 10.2$ height.	$\frac{6926}{599} = 11.55 =$ height.
Dist. of cent. of effort from mid.	$\frac{2178-1596}{459} = \frac{482}{459} = 1.05$ before.	$\frac{2852-2122}{599} = \frac{730}{599} = 1.2$ before.

On Luggers and Vessels of the Lateen Rig. (Plate I., figs. 14, 15, 21, 22, 23.)

The lugger possesses the advantages of having the least complicated rig, presenting the greatest surface of sail, with the least moment,* of having the surface of sail the least interrupted, and in consequence receiving the whole effort of the wind, and of being trimmed, under all points of sailing, with the greatest facility. In order that these vessels may have the advantage of reducing and increasing the sail at pleasure, to the greatest extent, they have commonly two sets of sails, large and small. This mode of rigging, however, can afford but little support to the masts, without doing away with some of its best qualities; for which reason, it would be dangerous to apply it to vessels of large dimensions. The lugsail likewise requires the most delicate management, and, under some points of sailing, the greatest care and attention, from its liability to be taken aback.

The lateen rig seems to have been preferred by the Greeks and Romans, and by most of the ancients who frequented the Mediterranean, where it is now in use, though much more common in the Levant. This mode of rigging does not present so great a surface of sail in relation to the moment, as the lug; but possesses advantages in light winds, when close-hauled. When sailing before the wind, and in a rough sea, it is the most disadvantageous of all sails; and when by the wind, it is more liable to be taken aback than the common lug.

The small support that can be given to the mast, and the great length o the yards, which, under some circumstances, cause the sail to sag to leeward, and render this rig very inconvenient, and ill-suited for voyages o any extent.

The most complete rig of this description, is that of the xebec. It has in general three sails, with a fore-mast raking forward, and the mizenmast aft, in order to extend the sail as much as possible. With the lateen is sometimes combined the square-sail, which is used when it is blowing hard, or whilst the vessel is scudding; at which time a square maintop-sail is frequently set.

The Spanish xebec has in general a lateen fore, with a square main-sail and mizen; the fore-mast, as is common in these vessels, raking forward.

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* The nearer the size of the head of the sails approaches the size of the foot, while the foot and area are constant, the less will the moment be in relation to the area; and it will be seen, on examination, that triangular sails, having the same area and base as quadrangular sails, will have the highest centre of effort.

Xebecs have sometimes three sets of sails: for moderate weather, when the wind is aft, an extensive square-sail for the main, and sometimes for the fore-sail; and when by the wind, large lateen sails; and for bad weather, small lateen sails.

The fore and main masts of these vessels are sometimes called block-masts, from their being short and square at the head. In the square of the mast-head are commonly fixed shives for the halyards. The shrouds of these vessels are set up as runners to cutters, that they may be shifted when the vessel goes about, and the yards are worked round the mast by parallels fixed to the yard, about one-third length of the yard from the weather-arm. The lee yard-arm is worked by braces, and supported by vangs near the mast, and the weather-arm by bow-lines, and the clue of the sails is extended by a sheet, as common to square-sails.

The other vessels that may be considered as modifications of the lugger[*] and lateen, are the galley, bugalet, felucca, pink, bark, settee, &c.; but as the mode of rigging several of them is not common, a general description is only given at the end.

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[*] Forfait, in his "Traité Elementaire de la Maure des Vaisseaux," Chap. III. and V., gives the following proportions for luggers and vessels of a lateen rig:

	LUGGERS.							LATEEN.			
	Mast, Top-mast, and Bowsprit.							Masts and Top-masts.			
	Masts.			Top-masts.			Bowsprit.	Masts.			Top-masts.
	Main.	Fore.	Mizen.	Main.	Fore.	Mizen.		Main.	Fore.	Mizen.	Main.
In Terms of Breadth 1 Ex.	3.603	3.176	2.313	1.794	1.470	—	2.794	2.4	2.3	1.333	—
2 „	3.455	2.759	1.888	1.091	1.091	—	2.649	2.4	2.3	1.333	1.333
3 „	3.458	2.792	2.291	1.458	1.208	1.0	2.708	2.298	1.915	galley	—
	YARDS AND BOOMS.							YARDS.			
	Lower Yards.			Top-sail Yards.			Outrigger.	Lower Yards.			Top-sail
	Main.	Fore.	Mizen.	Main.	Fore.	Mizen.		Main.	Fore.	Mizen.	Main.
In terms of Length 1 Ex.	.742	.661	.379	.495	.429	—	.420	1.017 square	.915	.466	—
2 „	.573	.454	.364	.424	.393	—	.364	.525	.475	.466	.433
3 „	.650	.550	.379	.437	.400	.250	.420	.891	.8	galley	—

Proportions for the Masts, Yards, &c., for the Lugger and Lateen Rig. (Plate I., figs. 14, 15, 21, 22, 23.)

Length. Breadth. Lugger { Ex. 1 — 55.0 ft. 16.75 ft. Lugger { Ex. 2 — 77.0 ft. 22. 7 ft. Chasse Maree { Ex. 3 — 38.6 ft. 11. 6 ft. Xebec .. Ex. 4 — 125.0 ft. 32. 0 ft. Lateen .. Ex. 5 — 125.0 ft. 32. 0 ft. Galley .. Ex. 6 — 74.5 ft. 17. 0 ft.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.					
		LUGGER RIG.			LATEEN RIG.		
		Ex. 1.	Ex. 2.	Ex. 3.	Ex. 4.	Ex. 5.	Ex. 6.
SPECIES OF MASTS AND GEAR.		Common.	Lugger.	Chasse Maree.	Xebec.	Main and fore-yards square.	Galleys two lateen-yards.
Main-mast hounded	Breadth . ... ×	3.024	3.5	3.87	2.4	2.4	2.3
Main-mast headed	Hounded length ..	.105	.1	.076	.125	.125	.06
Fore-mast hounded	Main-mast	.81	.77	.63	.95	.95	.83
Fore-mast headed	Hounded length ..	.054	.11	.12	.116	.116	.06
Driver, or mizen-mast hounded......	Main-mast........	.63	.56	—	.6	.6	—
Driver, or mizen-mast headed	Hounded length ..	.07	.08	—	.1	.1	—
Main-top-mast hounded	Main-mast........	.50	.33	—	—	.6	—
Main-top-mast pole	Hounded length ..	.25	.16	—	—	.05	—
Fore-top-mast hounded	Main-top-mast....	.80	.8	—	—	—	—
Fore-top-mast pole	Hounded length ..	—	.19	—	—	—	—
Mizen-top-mast hounded............	Main-top-mast....	—	.68	—	—	—	—
Mizen-top-mast pole...............	Hounded length ..	—	.2	—	—	—	—
Bowsprit	Fore-mast	.98	.87	—	—	—	—
Main-yard	Length	.69	.724	.71	—	.525	—
Fore-yard..........................	Main-yard	.84	.860	.65	—	.9	—
Mizen or driver-yard..............	do. do........	.51	.51	—	—	—	—
Main lateen-yard	Length	—	—	—	.96	.88	.9
Fore ditto.........................	Main-yard	—	—	—	.9	.82	.88
Mizen ditto	do. do.........	—	—	—	.45	—	—
Main-top-sail-yard................	do. do.........	.83	.66	—	—	—	—
Fore ditto	Main-top-sail-yard.	—	.9	—	—	—	—
Mizen ditto........................	do. do.....	—	.57	—	—	—	—
Main-yard (second)	Main-yard (large)..	.84	.8	.7	—	—	—
Fore-yard ditto	Fore-yard (large)..	.91	.9	—	—	—	—
Mizen-yard ditto	Mizen-yard (large)	.76	.7	—	—	—	—
Main-topsail-yard ditto	Main-top-sail-yard (large)..........	.69	.7	—	—	—	—
Outrigger..........................	Length	.56	.42	—	—	—	—
Fore-boom	do.	.45	.45	—	—	—	—
Menacle or boom	do.	.38	.38	—	—	—	—
Main-yard-arms { Weather arm	Length of yard....	—	—	—	.0125	—	.0117
Main-yard-arms { Lee arm.	do. do	—	—	—	.033	—	.0234
Fore-yard-arms { Weather arm	do. do.....	—	—	—	.014	—	.0104
Fore-yard-arms { Lee arm..........	do. do.....	—	—	—	.038	—	.0234
Mizen-yard-arms { Weather arm	do. do.....	—	—	—	.0136	.0136	—
Mizen-yard-arms { Lee arm	do. do.....	—	—	—	.0343	.0363	—
Main-yard-arm	do. do.....	.04	.030	.05	—	.08	—
Fore ditto	do. do.....	.04	.030	.08	—	.081	—
Mizen ditto........................	do. do.....	.04	.033	—	—	—	—
Main-top-sail-yard-arm	do. do.....	.10	.100	—	—	.13	—
Fore ditto ditto	do. do.....	.10	.100	—	—	—	—
Main-mast from the middle	Length on water-line	abaft. .037	abaft. .04	.000	.000	.000	before. .04
Fore-mast before the middle	do. do.....	.4	.396	.4	.407	.407	.41
Mizen-mast or driver abaft the middle	do. do.....	.444	.396	—	.407	.407	—
Main-mast to rake	In 12 feet	.16 in.	.12 in.	.6 in.	.000 forward.	.000 forward.	.000 forward.
Fore-mast to rake..................	do.	.10 in.	.6 in.	.3 in.	.23 in. aft.	.23 in. aft.	.12 in.
Mizen-mast to rake	do.	.20 in.	.24 in.	—	.12 in.	.12 in.	—
Bowsprit to stive	do.	.6 in.	.6 in.	—	—	—	—
Main-mast below the load-water-line	Breadth	.24	.25	.26	.23	.23	.21
Fore-mast below the load-water-line	do.	.17	.15	.17	.14	.14	.11
Mizen-mast below the load-water-line	do.	.09	.08		.04	.04	—
Centre of effort from the middle of the length of the water-line	Length of water-line	abaft. .024	before. .037	abaft. .19	abaft. .007	before. .09	before. .004
Height of the centre of effort above the load-water-line	Breadth	1.41	1.6	1.44	1.3	1.5	1.
Area of sail	Area of load-water section	3.8	3.95	3.44	2.63	2.11	2.26.
Moment of sail	do. do.....	88.5	139.3	60.	103.1	110.8	42.3

Lengths for Lower-masts, Top-masts, and Bowsprits.

Dimensions of Vessel.	LATEEN RIG.												Chasse Maree.				LUGGER RIG.																	
	Xebec and Lateen, with square, fore, and main yards.						With square, main, & fore yds.		Galley.								First Example.						Second Example.						First Example.		Second Example.		Bowsprit.	
	Main-mast		Fore-mast		Mizen-mast		Main Top-mast		Main-mast		Fore-mast		Main-mast		Fore-mast		Main-mast		Fore-mast		Mizen-mast		Main-mast		Fore-mast		Mizen-mast		Main Top-mast		Main Top-mast			
Breadth	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Pole	Hounded	Pole	First Example	Second Example
12.0	28.3	3.6	27.4	3.2	17.3	1.7	17.3	.86.4	27.6	1.6	22.9	1.3	46.4	3.5	29.2	3.5	36.3	3.8	29.4	1.6	22.8	1.6	42.0	4.2	32.3	3.2	23.5	1.8	18.1	4.5	13.8	2.2	28.8	28.1
12.5	30.0	3.7	28.5	3.3	18.0	1.8	18.0	.90.0	28.7	1.7	23.9	1.4	48.4	3.7	30.5	3.6	37.8	3.9	30.8	1.6	23.8	1.6	43.7	4.3	33.6	3.3	24.4	1.9	18.9	4.7	14.4	2.3	29.9	29.2
13.0	31.2	3.9	29.6	3.4	18.7	1.9	18.7	.93.6	29.9	1.9	24.8	1.5	50.3	3.8	31.7	3.8	39.3	4.1	31.8	1.7	24.7	1.7	45.5	4.5	35.0	3.5	25.5	2.0	19.6	4.9	15.0	2.4	31.1	30.4
13.5	32.4	4.0	30.8	3.6	19.4	1.9	19.4	.97.2	31.0	2.0	25.8	1.5	52.3	4.0	32.9	3.9	40.8	4.3	33.0	1.7	25.7	1.7	47.2	4.7	36.3	3.6	26.4	2.1	20.4	5.1	15.5	2.5	32.3	31.5
14.0	33.6	4.2	31.9	3.7	20.2	2.0	20.2	1.0	32.2	2.0	26.7	1.6	54.2	4.1	34.1	4.1	42.3	4.4	34.2	1.8	26.6	1.8	49.0	4.9	37.3	3.7	27.4	2.2	21.1	5.2	16.1	2.5	33.5	32.7
14.5	34.8	4.3	33.1	3.8	21.0	2.1	21.0	1.0	33.3	2.1	27.7	1.7	56.1	4.3	35.3	4.2	43.8	4.6	35.4	1.8	27.6	1.8	50.7	5.0	39.0	3.9	28.4	2.2	21.9	5.4	16.7	2.6	34.6	33.9
15.0	36.0	4.5	34.2	4.0	21.6	2.1	21.6	1.1	34.5	2.2	28.6	1.7	58.0	4.4	36.6	4.4	45.3	4.7	36.6	1.9	28.5	1.9	52.5	5.2	40.4	4.0	29.4	2.3	22.6	5.6	17.3	2.7	35.8	35.1
15.5	37.2	4.6	35.3	4.1	22.3	2.2	22.3	1.1	35.6	2.2	29.6	1.8	60.0	4.5	37.8	4.5	46.8	4.9	37.9	2.0	29.5	2.0	54.2	5.4	41.7	4.1	30.3	2.4	23.4	5.8	17.8	2.8	37.1	36.2
16.0	38.4	4.8	36.5	4.2	23.0	2.2	23.0	1.1	36.8	2.3	30.5	1.8	62.0	4.7	39.0	4.7	48.4	5.1	39.2	2.1	30.4	2.1	56.0	5.6	43.1	4.3	31.3	2.5	24.2	6.0	18.4	2.9	38.4	37.4
16.5	39.6	4.9	37.6	4.4	23.8	2.3	23.8	1.2	37.9	2.4	31.5	1.9	63.9	4.8	40.2	4.8	49.9	5.2	40.4	2.1	31.4	2.1	57.7	5.7	44.4	4.4	32.3	2.6	24.9	6.2	19.0	3.0	39.5	38.6
17.0	40.8	5.1	38.8	4.5	24.5	2.4	24.5	1.2	39.1	2.4	32.4	1.9	65.8	5.0	41.4	5.0	51.4	5.3	41.6	2.2	32.3	2.2	59.5	5.9	45.8	4.5	33.3	2.6	25.7	6.4	19.6	3.1	40.7	39.8
17.5	42.0	5.2	39.9	4.6	25.2	2.4	25.2	1.3	40.2	2.5	33.4	2.0	67.7	5.1	42.7	5.1	52.9	5.5	42.8	2.3	33.3	2.3	61.2	6.1	47.1	4.7	34.2	2.7	26.5	6.7	20.1	3.2	41.9	40.9
18.0	43.2	5.4	41.0	4.8	25.9	2.5	25.9	1.3	41.2	2.6	34.4	2.1	69.7	5.3	43.9	5.3	54.6	5.7	44.0	2.3	34.2	2.3	63.0	6.3	48.5	4.8	35.2	2.8	27.2	6.8	20.7	3.3	43.1	41.3
18.5	44.4	5.5	42.2	4.9	26.6	2.6	26.6	1.3	42.5	2.6	35.3	2.1	71.6	5.4	45.0	5.4	55.9	5.8	45.2	2.4	35.2	2.4	64.7	6.4	49.8	4.9	36.2	2.9	27.9	6.9	21.3	3.4	44.2	43.3
19.0	45.6	5.7	43.3	5.0	27.4	2.7	27.4	1.4	43.7	2.7	36.3	2.2	73.5	5.6	46.3	5.5	57.4	6.0	46.4	2.5	36.1	2.5	66.5	6.6	51.2	5.1	37.2	2.9	28.7	7.1	21.9	3.5	45.4	44.5
19.5	46.8	5.8	44.5	5.1	28.1	2.7	28.1	1.4	44.8	2.8	37.2	2.2	75.4	5.7	47.5	5.7	58.9	6.2	47.7	2.5	37.1	2.5	68.2	6.8	52.5	5.2	38.2	3.0	29.5	7.3	22.5	3.6	46.9	45.6
20.0	48.0	6.0	45.6	5.3	28.8	2.8	28.8	1.4	46.0	2.8	38.2	2.3	77.4	5.9	48.8	5.8	60.5	6.3	49.0	2.6	38.1	2.6	70.0	7.0	53.9	5.3	39.2	3.1	30.2	7.5	23.1	3.7	47.5	46.8
20.5	49.2	6.1	46.7	5.4	29.5	2.9	29.5	1.5	47.1	2.9	39.1	2.3	79.3	6.0	50.0	6.0	62.0	6.5	50.2	2.7	39.1	2.7	71.7	7.1	55.2	5.5	40.2	3.2	31.0	7.7	23.6	3.8	48.7	48.1
21.0	50.4	6.3	47.9	5.5	30.2	3.0	30.2	1.5	48.0	3.0	40.1	2.4	81.3	6.2	51.2	6.1	63.5	6.7	51.5	2.8	40.0	2.8	73.5	7.3	56.5	5.6	41.2	3.3	31.8	7.9	24.2	3.9	49.9	49.2
21.5	51.6	6.4	49.0	5.7	31.0	3.1	31.0	1.5	49.4	3.0	41.0	2.5	83.2	6.3	52.4	6.3	65.0	6.8	52.7	2.8	41.0	2.8	75.2	7.5	57.9	5.7	42.0	3.4	32.5	8.1	24.8	4.0	51.1	50.4
22.0	52.8	6.5	50.2	5.8	31.7	3.2	31.7	1.6	50.6	3.1	42.0	2.5	85.1	6.5	53.6	6.4	66.5	7.0	53.9	2.9	41.9	2.9	77.0	7.7	59.3	5.9	43.0	3.4	33.3	8.3	25.4	4.1	52.3	51.6
22.5	54.0	6.7	51.3	5.9	32.4	3.2	32.4	1.6	51.7	3.2	42.9	2.6	87.1	6.6	54.8	6.6	68.0	7.1	55.1	3.0	42.9	3.0	78.7	7.8	60.6	6.0	44.0	3.5	34.0	8.5	26.0	4.2	53.5	52.7
23.0	55.2	6.9	52.4	6.1	33.1	3.3	33.1	1.6	52.9	3.3	43.9	2.6	89.0	6.8	56.1	6.7	69.5	7.3	56.4	3.0	43.8	3.0	80.5	8.0	62.0	6.2	45.0	3.6	34.8	8.7	26.6	4.2	54.7	53.9
23.5	56.4	7.0	53.6	6.2	33.8	3.4	33.8	1.7	54.0	3.3	44.9	2.7	90.9	6.9	57.3	6.9	71.0	7.4	57.6	3.1	44.8	3.1	82.2	8.2	63.3	6.3	46.0	3.7	35.5	8.9	27.1	4.3	55.8	55.1
24.0	57.6	7.2	55.7	6.3	34.6	3.5	34.6	1.7	55.2	3.4	45.8	2.7	92.9	7.0	58.5	7.0	72.5	7.6	58.8	3.2	45.7	3.2	84.0	8.4	64.7	6.4	46.9	3.8	36.3	9.1	27.7	4.4	57.0	56.3
24.5	58.8	7.3	55.9	6.5	35.3	3.5	35.3	1.8	56.3	3.5	46.8	2.8	94.8	7.2	59.7	7.2	74.1	7.8	60.1	3.2	46.7	3.2	85.7	8.5	66.0	6.6	47.9	3.8	37.0	9.3	28.3	4.5	58.2	57.4
25.0	60.0	7.5	57.0	6.6	36.0	3.6	36.0	1.8	57.5	3.5	47.7	2.9	96.7	7.3	60.9	7.3	75.6	7.9	61.3	3.3	47.6	3.3	87.5	8.7	67.4	6.7	48.9	3.9	37.8	9.5	28.9	4.6	59.4	58.6
25.5	61.2	7.6	58.1	6.7	36.7	3.7	36.7	1.8	58.6	3.6	48.7	2.9	98.7	7.5	62.2	7.5	77.1	8.1	62.5	3.4	48.6	3.4	89.2	8.9	68.7	6.8	49.9	4.0	38.6	9.6	29.4	4.7	60.6	59.8
26.0	62.4	7.8	59.3	6.9	37.4	3.7	37.4	1.9	59.8	3.7	49.6	3.0	100.6	7.6	63.4	7.6	78.6	8.2	63.7	3.4	49.5	3.4	91.0	9.1	70.0	7.0	50.8	4.1	39.3	9.8	30.0	4.8	61.8	61.0
26.5	63.6	7.9	60.4	7.0	38.1	3.8	38.1	1.9	60.9	3.7	50.6	3.0	102.5	7.8	64.6	7.7	80.2	8.4	65.0	3.5	50.5	3.5	92.7	9.2	71.4	7.1	51.8	4.1	40.0	10.0	30.6	4.9	63.0	62.1
27.0	64.8	8.1	61.6	7.1	38.9	3.9	38.9	1.9	62.1	3.8	51.5	3.1	104.5	7.9	65.8	7.9	81.7	8.6	66.2	3.6	51.5	3.6	94.5	9.4	72.7	7.2	52.8	4.2	40.8	10.2	31.2	5.0	64.2	63.3

Length of Yards.

Dimensions of Vessel.	LATEEN RIG.									SQUARE YARDS.			Dimensions of Vessel.	LATEEN RIG.									SQUARE YARDS.		
	Xebec.			Square Main and Fore.				Galley.		Chasse Maree.				Xebec.			Square Main and Fore.				Galley.		Chasse Maree.		
Length.	Main	Fore	Mizen	Main	Fore	Mizen	Main top-mast	Main	Fore	Main	Fore	Second Main	Length.	Main	Fore	Mizen	Main	Fore	Mizen	Main top-mast	Main	Fore	Main	Fore	Second Main
40	38.4	34.6	17.3	21.0	18.9	18.5	17.5	36.0	31.7	28.4	18.5	19.9	65	62.4	56.2	28.1	34.1	30.7	30.0	28.4	58.5	51.5	46.1	29.9	32.3
41	39.4	35.4	17.7	21.5	19.4	18.9	17.9	36.9	32.5	29.1	18.9	20.4	66	63.4	57.0	28.5	34.6	31.2	30.5	28.8	59.4	52.3	46.9	30.4	32.8
42	40.3	36.3	18.1	22.0	19.8	19.4	18.3	37.8	33.3	29.8	19.4	20.9	67	64.3	57.9	28.9	35.2	31.6	30.9	29.2	60.3	53.1	47.6	30.9	33.2
43	41.3	37.1	18.6	22.6	20.3	19.9	18.8	38.7	34.0	30.5	19.8	21.4	68	65.3	58.7	29.4	35.7	32.1	31.4	29.7	61.2	53.7	48.3	31.3	33.7
44	42.2	38.0	19.0	23.1	20.8	20.3	19.2	39.6	34.8	31.1	20.3	21.9	69	66.2	59.6	29.8	36.2	33.6	31.9	30.1	62.1	54.6	49.0	31.8	34.2
45	43.2	38.9	19.4	23.6	21.3	20.8	19.6	40.5	35.6	31.9	20.8	22.4	70	67.2	60.5	30.2	36.7	33.1	32.3	30.5	63.0	55.4	49.7	32.3	34.7
46	44.2	39.7	19.9	24.1	21.7	21.2	20.1	41.4	36.4	32.7	21.2	22.9	71	68.2	61.3	30.7	37.3	33.5	32.8	31.0	63.9	56.2	50.4	32.7	35.2
47	45.1	40.6	20.3	24.7	22.2	21.7	20.5	42.3	37.2	33.4	21.7	23.3	72	69.1	62.2	31.1	37.8	34.0	33.3	31.4	64.8	57.0	51.1	33.2	35.7
48	46.1	41.5	20.7	25.2	22.7	22.2	20.9	43.2	38.0	34.1	22.1	23.8	73	70.1	63.1	31.5	38.3	34.5	33.7	31.9	65.7	57.8	51.8	33.6	36.2
49	47.0	42.3	21.2	25.7	23.1	22.6	21.4	44.1	38.8	34.8	22.6	24.3	74	71.0	63.9	31.9	38.8	35.0	34.2	32.3	66.6	58.6	52.5	34.2	36.7
50	48.0	43.2	21.6	26.2	23.6	23.1	21.8	45.0	39.6	35.5	23.1	24.8	75	72.0	64.8	32.4	39.4	35.4	34.6	32.7	67.5	59.4	53.2	34.6	37.2
51	49.0	44.1	22.0	26.8	24.1	23.6	22.3	45.9	40.4	36.2	23.5	25.3	76	73.0	65.7	32.8	39.9	35.9	35.1	33.2	68.4	60.2	54.0	35.1	37.7
52	50.0	44.9	22.5	27.3	24.6	24.0	22.7	46.8	41.2	36.9	24.0	25.8	77	73.9	66.5	33.3	40.4	36.3	35.6	33.6	69.3	61.0	54.7	35.5	38.2
53	50.9	45.8	22.9	27.8	25.0	24.5	23.1	47.7	42.0	37.6	24.4	26.3	78	74.9	67.4	33.7	40.9	36.8	36.0	34.0	70.2	61.8	55.4	36.0	38.7
54	51.8	46.6	23.3	28.3	25.5	24.9	23.6	48.6	42.8	38.3	24.9	26.8	79	75.8	68.2	34.1	41.5	37.3	36.5	34.5	71.1	62.6	56.1	36.5	39.2
55	52.8	47.5	23.8	28.9	26.0	25.4	24.0	49.5	43.6	39.0	25.4	27.3	80	76.8	69.1	34.6	42.0	37.8	37.0	34.9	72.0	63.4	56.8	36.9	39.7
56	53.8	48.4	24.2	29.4	26.5	25.9	24.4	50.4	44.3	39.8	25.8	27.8	81	77.8	70.0	35.0	42.5	38.3	37.4	35.3	72.9	64.1	57.5	37.4	40.2
57	54.7	49.2	24.6	29.9	26.9	26.3	24.9	51.3	45.1	40.5	26.3	28.3	82	78.7	70.8	35.4	43.0	38.7	37.9	35.8	73.8	64.9	58.2	37.8	40.7
58	55.7	50.1	25.0	30.4	27.4	26.8	25.3	52.2	45.9	41.2	26.7	28.8	83	79.7	71.7	35.8	43.6	39.2	38.3	36.2	74.7	65.7	58.9	38.3	41.2
59	56.6	51.0	25.5	31.0	27.9	27.2	25.7	53.1	46.7	41.9	27.2	29.3	84	80.6	72.6	36.3	44.1	39.7	38.9	36.7	75.6	66.5	59.6	38.7	41.7
60	57.6	51.8	25.9	31.5	28.3	27.7	26.2	54.0	47.5	42.6	27.8	29.8	85	81.6	73.4	36.7	44.6	40.2	39.3	37.1	76.5	67.3	60.3	39.2	42.2
61	58.6	52.7	26.3	32.0	28.8	28.2	26.6	54.9	48.3	43.3	28.1	30.3	86	82.6	74.3	37.1	45.1	40.6	39.7	37.5	77.4	68.1	61.1	39.6	42.7
62	59.5	53.6	26.8	32.5	29.3	28.6	27.1	55.8	49.1	44.0	28.6	30.8	87	83.5	75.2	37.6	45.7	41.1	40.2	38.0	78.3	68.9	61.7	40.1	43.2
63	60.5	54.4	27.2	33.1	29.8	29.1	27.5	56.7	49.9	44.7	29.0	31.3	88	84.5	76.0	38.0	46.2	41.6	40.6	38.4	79.2	69.7	62.5	40.6	43.7
64	61.4	55.3	27.6	33.6	30.2	29.6	27.9	57.6	50.7	45.4	29.5	31.8	89	85.4	76.9	38.4	46.7	42.0	41.1	38.8	80.1	70.5	63.2	41.1	44.2
													90	86.4	77.8	38.9	47.2	42.5	41.6	39.3	81.0	71.3	63.9	41.5	44.7

Luggers' Yards, and Booms.

Dimensions.	MAIN-YARD.				FORE-YARD.				DRIVER YARD.				OUTRIGGER.		FORE-BOOM.		MENACLE OR BOOM.		MAIN-TOP-SAIL-YARD.			
	Large.		Small.		Large.		Small.		Large.		Small.								Large.		Small.	
Length	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example
38	26.2	25.2	22.0	20.1	13.6	21.6	12.3	19.4	13.4	14.3	10.1	10.0	21.2	15.9	17.1	17.1	14.4	14.4	21.7	16.6	14.9	11.6
39	26.9	26.01	22.6	20.8	14.0	22.3	12.7	20.07	13.7	14.7	10.4	10.3	21.8	16.3	17.5	17.5	14.8	14.8	22.3	17.1	15.3	11.9
40	27.6	26.7	23.1	21.3	14.3	22.9	13.0	20.6	14.0	15.1	10.6	10.5	22.4	16.8	18.0	18.0	15.2	15.2	22.9	17.6	15.8	12.3
41	28.2	27.3	23.7	21.8	14.6	23.4	13.3	21.06	14.4	15.5	10.9	10.8	22.9	17.2	18.4	18.4	15.5	15.5	23.4	18.0	16.1	12.6
42	28.9	27.9	24.3	22.3	15.0	24.03	13.6	21.6	14.7	15.8	11.1	11.0	23.5	17.6	18.9	18.9	15.9	15.9	23.9	18.4	16.4	12.8
43	29.6	28.7	24.9	22.9	15.4	24.6	14.0	22.1	15.1	16.2	11.4	11.3	24.0	18.0	19.3	19.3	16.3	16.3	24.5	18.9	17.0	13.2
44	30.3	29.3	25.5	23.4	15.7	25.2	14.3	22.6	15.4	16 5	11.7	11.5	24.6	18.4	19.8	19.8	16.7	16.7	25.1	19.3	17.3	13.5
45	31.0	30.06	26.0	24.04	16.1	25.8	14.6	23.2	15.8	17.0	12.0	11.9	25.2	18.9	20.2	20.2	17.1	17.1	25.7	19.8	17.7	13.8
46	31.7	30.6	26.6	24.4	16.5	26.3	15.0	23.6	16.1	17.4	12.2	12.1	25.7	19.3	20.7	20.7	17.4	17.4	26.3	20.2	18.1	14.1
47	32.4	31.3	27.2	25.04	16.8	27.0	15.3	24.3	16.5	17.7	12.5	12.3	26.3	19.7	21.1	21.1	17.8	17.8	26.9	20.7	18.6	14.49
48	33.1	32.04	27.8	25.63	17.2	27.5	15.6	24.7	17.0	18.1	12.8	12.6	26.8	20.1	21.6	21.6	18.2	18.2	27.4	21.1	19.0	14.7
49	33.8	32.6	28.4	26.08	17.5	28.08	16.0	25.2	17.2	18.5	13.0	12.9	27.4	20.5	22.0	22.0	18.6	18.6	28.0	21.6	19.3	15.1
50	34.5	33.3	28.9	26.64	17.9	28.8	16.3	25.9	17.5	18.8	13.3	13.1	28.0	21.0	22.5	22.5	19.0	19.0	28.6	21.9	19.7	15.3
51	35.1	34.02	29.5	27.21	18.2	29.2	16.6	26.2	18.0	19.2	13.6	13.4	28.5	21.4	22.9	22.9	19.4	19.4	29.1	22.5	20.0	15.7
52	35.8	34.6	30.1	27.7	18.6	29.7	17.0	26.7	18.3	19.6	13.9	13.7	29.1	21.8	23.4	23.4	19.7	19.7	29.7	22.8	20.5	15.9
53	36.5	35.3	30.7	28.2	18.9	30.3	17.1	27.2	18.6	20.0	14.1	14.0	29.6	22.0	23.8	23.8	20.1	20.1	30.2	23.4	20.8	16.3
54	37.2	36.0	31.2	28.8	19.3	30.9	17.5	27.8	19.0	20.4	14.4	14.2	30.2	22.6	24.3	24.3	20.5	20.5	30.8	23.7	21.2	16.6
55	37.9	36.7	31.8	29.3	19.7	31.5	17.9	28.3	19.3	20.8	14.6	14.5	30.8	23.1	24.7	24.7	20.9	20.9	31.4	24.3	21.6	17.0
56	38.6	37.3	32.4	29.8	20.0	32.1	18.2	28.9	19.7	21.1	14.9	14.7	31.3	23.5	25.2	25.2	21.2	21.2	32.0	24.5	22.0	17.1
57	39.3	38.0	33.0	30.4	20.4	32.6	18.5	29.3	20.0	21.5	15.2	15.0	31.9	23.9	25.6	25.6	21.6	21.6	32.6	25.1	22.5	17.5
58	40.0	38.7	33.6	30.9	20.8	33.3	19.0	29.9	20.4	22.0	15.5	15.4	32.4	24.3	26.1	26.1	22.0	22.0	33.2	25.4	23.0	17.7
59	40.7	39.3	34.2	31.4	21.1	33.8	19.5	30.4	20.7	22.2	15.8	15.8	33.0	24.7	26.5	26.5	22.4	22.4	33.8	26.0	23.3	18 1

Luggers' Yards, and Booms (continued).

Dimensions.	MAIN-YARD.				FORE-YARD.				DRIVER YARD.				OUTRIGGER.		FORE-BOOM.		MENACLE OR BOOM.		MAIN-TOP-SAIL-YARD.			
	Large.		Small.		Large.		Small.		Large.		Small.								Large.		Small.	
Length	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example	1st Example	2d Example
60	41.4	40.0	34.7	32.0	21.5	34.3	19.5	30.8	21.1	22.7	16.0	15.8	33.0	25.2	27.0	27.0	22.8	22.8	34.3	26.3	23.6	18.4
61	42.1	40.6	35.3	32.4	21.9	34.9	20.0	31.4	21.4	23.0	16.2	16.1	34.1	25.6	27.4	27.4	23.1	23.1	35.0	26.8	24.1	18.7
62	42.7	41.4	35.8	33.1	22.2	35.5	20.2	31.9	21.8	23.4	16.5	16.3	34.7	26.0	27.9	27.9	23.5	23.5	35.4	27.2	24.4	19.04
63	43.4	42.0	36.4	33.6	22.5	36.09	20.4	32.4	22.1	23.8	16.8	16.6	35.2	26.4	28.3	28.3	23.9	23.9	36.0	27.7	24.8	19.39
64	44.1	42.6	37.0	34.08	22.9	36.6	20.8	32.9	22.5	24.1	17.1	16.8	35.8	26.9	28.8	28.8	24.3	24.3	36.6	28.08	25.2	19.6
65	44.8	43.3	37.6	34.6	23.3	37.3	21.2	33.5	22.8	24.5	17.3	17.1	36.4	27.3	29.2	29.2	24.7	24.7	37.1	28.6	25.6	20.0
66	45.5	44.1	38.2	35.2	23.6	37.8	21.4	34.02	23.2	25.0	17.6	17.5	37.0	27.7	29.7	29.7	25.0	25.0	37.7	29.07	26.0	20.3
67	46.2	44.7	38.8	35.7	24.0	38.4	21.8	34.5	23.5	25.3	17.8	17.7	37.5	28.1	30.1	30.1	25.4	25.4	38.3	29.5	26.5	20.6
68	46.9	45.3	39.4	36.2	24.4	38.9	22.2	35.0	24.0	25.7	18.2	17.9	38.0	28.5	30.6	30.6	25.8	25.8	39.0	29.8	27.0	20.8
69	47.6	46.0	39.9	36.8	24.7	39.7	22.4	35.6	24.2	26.1	18.4	18.2	38.6	29.0	31.3	31.3	26.2	26.2	39.5	30.3	27.5	21.2
70	48.3	46.8	40.5	37.4	25.1	40.2	22.8	36.1	24.6	26.5	18.7	18.5	39.2	29.4	31.5	31.5	26.6	26.6	40.0	30.8	27.6	21.5
71	49.0	47.3	41.1	37.8	25.5	40.6	23.2	36.5	25.0	26.8	19.0	18.7	39.7	29.8	31.9	31.9	27.0	27.0	40.6	31.2	28.0	21.8
72	49.7	48.0	41.7	38.4	25.8	41.4	23.4	37.2	25.3	27.2	19.2	19.0	40.3	30.2	32.4	32.4	27.3	27.3	41.2	31.6	28.4	22.1
73	50.3	48.6	42.2	38.8	26.1	41.8	23.7	37.6	25.6	27.6	19.4	19.3	40.8	30.6	32.8	32.8	27.7	27.7	41.7	32.1	28.7	22.4
74	51.0	49.4	42.8	39.5	26.5	42.4	24.1	38.1	26.0	28.0	19.7	19.6	41.4	31.0	33.3	33.3	28.1	28.1	42.3	32.5	29.1	22.7
75	51.7	50.0	43.4	40.0	26.9	42.8	24.4	38.5	26.3	28.3	20.0	19.8	42.0	31.5	33.7	33.7	28.5	28.5	43.0	32.9	29.6	23.03
76	52.4	50.6	44.0	40.4	27.2	43.5	24.7	39.1	26.7	28.7	20.3	20.0	42.5	32.0	34.2	34.2	29.0	29.0	43.5	33.4	30.0	23.3
77	53.1	51.3	44.6	41.04	27.6	44.2	25.0	39.7	27.0	29.1	20.5	20.3	43.1	32.3	34.6	34.6	29.2	29.2	44.0	33.8	30.3	23.6
78	53.8	52.0	45.2	41.6	28.0	44.7	25.4	40.2	27.4	29.4	20.8	20.5	43.6	32.7	35.1	35.1	29.6	29.6	44.6	34.2	30.7	23.9
79	54.5	52.7	45.8	42.1	28.3	45.2	25.7	40.6	27.8	29.8	21.1	20.8	44.2	33.1	35.5	35.5	30.0	30.0	45.2	34.7	31.2	24.29
80	55.2	53.3	46.4	42.6	28.7	45.9	26.1	41.3	28.1	30.2	21.3	21.1	44.8	33.6	36.0	36.0	30.4	30.4	45.8	35.1	31.6	24.5

On Cutters, Schooners, &c.

Cutters possess advantages over other vessels, from the manner in which the surface of their sails is distributed. When their head sheets are let go, they come too with the greatest readiness; and whilst they trim well, and the evolutions of the different sails are quickly made in working, they cannot be taken a-back, on which account they are rendered more safe. This rig cannot, however, be carried beyond certain limits, because of the size that would necessarily be given to one sail, which would not only make it difficult to support the mast, and work the sail, but dangerous and of less effect, on account of its sagging at the peak to leeward.

Schooners have great superiority on a bow-line, and when the wind is large, their square sails may be used to great advantage, while they can be worked with few men. It is probable that their fore and aft, or Bermuda sails as they are frequently called, were substituted for lateen sails, on account of their being more effective when going free, and more convenient in tacking, and because this rig is not encumbered with large yards. Schooners, as vessels of war, have the advantage of cutters, in their greater number of sails, which renders them less liable to be disabled in time of action. The Bermuda schooner, or schooner with three masts, must, for the same reason, have a similar advantage over the common one. As these vessels, and especially cutters, have a much greater draught of water aft than they have forward, the mean direction of the water is brought abaft the middle of their lengths, and consequently the centre of effort of the sails must be much further aft in these than in other vessels. This causes them to work quickly, since by the centre of effort of the sails being aft, they come readily to the wind when in stays, and by the common centre of gravity being in general abaft the middle, their head-sails have more effect, and they readily pay off, consequently stay in a much smaller space, which constitutes the most desirable qualities of vessels of this rig.

The ketch, koff, hourio, galliot, and shallop, are modifications of this kind of rig. (*See Description at the end.*)

Proportions for the Masts, Booms, &c. of Cutters.

		Length.		Breadth.
Yachts	Ex. 1.	63. 1 ft.	—	19.2 ft.
	Ex. 2.	57. 25ft.	—	18.8 ft.
	Ex. 3.	58. 0 ft	—	18.0 ft.
Revenue Cruisers	Ex. 1.	63. 7 ft.	—	22.1 ft.
	Ex: 2.	55. 8 ft.	—	18.5 ft.

SPECIES OF GEAR.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.					
		Yachts.			For Yachts' Mizens.*	Revenue Cruisers.	
		Cutter.	Cutter.	With a mizen as ketch.		Cutter.	
		Ex. 1.	Ex. 2.	Ex. 3		Ex. 1.	Ex. 2.
Main-mast hounded	Breadth extreme ...... ×	3. 34	2. 89	2. 94	—	2. 63	2. 6
Main-mast headed	Hounded length	. 2	. 23	. 21	—	. 20	. 23
Mizen-mast hounded	Main hounded	—	—	. 9	. 7	—	—
Mizen-mast headed	Hounded length	—	—	. 12	. 12	—	—
Main-top-mast hounded	Main-mast hounded	. 69	. 61	. 71	—	. 68	. 66
Main-top-mast head or pole	Hounded length	. 26	. 17	. 18	—	. 3	. 28
Top-gallant-mast hounded	Main-top-mast hounded	—	—	—	—	—	—
Top-gallant-mast pole	Hounded length	—	—	—	—	—	—
Mizen-top-mast hounded	Main-top-mast hounded	—	—	. 48	—	—	—
Mizen-top-mast pole	Hounded length	—	—	. 16	—	—	—
Main-boom	Length on deck	. 936	. 955	. 5	of a length to clear the mizen.	. 92	. 87
Main-gaff to yawls	Length on deck	—	—	—	5. 6	—	—
Main-gaff to cutters	Main-boom	. 627	. 647	1. 0	—	. 68	. 64
Mizen-boom	Main-boom	—	—	1. 0	—	—	—
Mizen-gaff	Main-gaff	—	—	. 5	. 5	—	—
Bowsprit	Length on deck	. 825	. 774	. 8	—	. 8	. 79
Outrigger to yawl	Length on deck	—	—	—	. 55	—	—
Square-sail-yard	Length on deck	. 8	. 78	. 8	—	. 87	. 84
Top-sail-yard	Square-sail-yard	. 7	. 62	. 7	—	. 72	. 7
Top-gallant-yard	Square-sail-yard	. 5	. 45	. 5	—	. 51	. 44
Mizen or driver-yard to yawls	Main-gaff	—	—	—	. 7	—	—
Square-sail-boom	Square-sail-yard	. 58	. 52	. 56	—	. 59	. 51
Gaff-top-sail-yard	Gaff	. 25	. 25	. 25	—	. 25	. 25
Ringtail boom	Main-boom	. 6	. 5	—	—	. 6	. 5
Main-mast before the middle on the water-line	Length of water-line taken from the fore part of the stem to the after part of the post	. 112	. 14	. 125	—	. 13	. 101
Mizen-mast abaft	Ditto ditto	—	—	. 395	as the transom.	—	—
Main-mast to rake from the water-line	In 12 feet	12 in.	15 in.	12 in.	—	14½ in.	13 in
Mizen-mast to rake from the water-line	In 12 feet	—	—	18	—	—	—
Bowsprit to stive from the water-line	In 12 feet	7¾	10½	—	—	18	16
Main-mast below the loadwater-line	Breadth	. 31	. 3	. 31	—	. 272	. 269
Mizen-mast below the loadwater-line	Breadth	—	—	. 41	—	—	—
Bowsprit housed from the fore-part of the stem	Breadth	. 62 abaft.	. 53 abaft.	. 65 abaft.	— abaft.	. 65 abaft.	. 63 abaft.
Centre of effort from the middle of the length of the water-line	Length of water-line	. 0395	. 0346	. 0326	—	. 0167	. 017
Height of centre of effort above the loadwater-line	Breadth	1. 5	1. 45	1. 3	—	1. 27	1. 26
Area of sail	Area of loadwater section	3. 2	3. 55	3. 3	—	3. 56	3. 5
Moment of sail	Area of loadwater section	89. 1	91. 4	88. 6	—	97. 7	95. 2
Difference of draught of water excess aft	....	54 in.	53 in.	15 in.	—	65 in.	24. 0

* The alteration that takes place in the position and area of sail, by altering a cutter to a yawl, may be seen in the following example, as taken from a cutter of 85 tons, before and after the alteration.

AS A CUTTER.

	Area		Height		Moment
Main-sail	1566	×	29.4	=	46040
Fore-sail	367	×	20.0	=	7340
Jib (second)	541	×	19.5	=	10549
Total area	2474				63929

Height of centre of effort...... $\frac{63929}{2471} = 25.8.$

	Distance from middle		Moment abaft	Moment before
×	14.8	=	23177	—
×	13 7	=	—	5023
×	32 8	=	—	17731
			23177	22754

Distance of centre of effort from the middle .... $\frac{23177-22754}{2474} = .17$ abaft

A YAWL.

	Area		Height		Moment
Main-sail	1241	×	30.7	=	38118
Mizen	754	×	20.1	=	15167
Fore-sail	367	×	20.0	=	7340
Jib (second)	541	×	19.5	=	10549
Total area	2903				71169

Height of centre of effort...... $\frac{71169}{2903} = 24.5.$

	Distance from middle		Moment abaft	Moment before
×	10.2	=	12663	—
×	45.5	=	34334	—
×	13.7	=	—	5023
×	32.8	=	—	17731
			46997	22754

Distance of centre of effort from the middle ...... $\frac{46097-22754}{2903} = 8.3$ abaft.

This example is made with the large mizen; the small mizen was .85 the large at the head, with a drop of .8 the large.

Lengths for Lower-masts, and Top-masts.

Dimensions of Cutters.	YACHTS AS CUTTERS.																Mizen-mast of Yawls.		REVENUE CUTTERS.							
	1st Example.*				2nd Example.				3rd Example. Cutter with a Mizen-mast as Ketch.										1st Example.				2nd Example.			
	Mast.		Top-mast.		Mast.		Top-mast		Main-mast.		Mizen-mast.		Main Top-mast.		Mizen Top mast.				Mast.		Top-mast.		Mast.		Top-mast.	
Breadth	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed	Hounded	Headed
15.0	50.1	10.0	34.6	9.0	43.3	9.9	27.7	4.7	44.1	9.3	39.7	4.8	34.3	6.2	16.5	2.6	30.3	3.6	39.4	9.1	26.8	8.0	39.0	8.6	30.7	3.3
15.5	51.8	10.3	35.7	9.3	44.8	10.3	28.7	4.9	45.6	9.6	41.0	4.9	35.4	6.4	17.0	2.7	31.3	3.8	40.8	9.4	27.7	8.3	40.3	8.9	31.4	3.4
16.0	53.4	10.6	36.9	9.6	46.2	10.6	29.6	5.0	47.0	9.9	42.3	5.1	36.6	6.6	17.6	2.8	32.4	3.9	42.1	9.7	28.6	8.6	41.6	9.1	32.0	3.5
16.5	55.1	11.0	38.0	9.9	47.7	10.9	30.5	5.2	48.5	10.2	43.6	5.2	37.7	6.8	18.1	2.9	33.4	4.0	43.4	10.0	29.5	8.8	42.9	9.4	32.7	3.6
17.0	56.8	11.3	39.2	10.2	49.1	11.3	31.4	5.3	50.0	10.5	45.0	5.4	38.9	7.0	18.7	3.0	34.4	4.1	44.7	10.3	30.4	9.1	44.2	9.7	33.4	3.7
17.5	58.4	11.7	40.3	10.5	50.6	11.6	32.4	5.5	51.4	10.8	46.3	5.5	40.0	7.2	19.2	3.1	35.4	4.2	46.0	10.6	31.3	9.4	45.5	10.0	34.1	3.8
18.0	60.1	12.0	41.5	10.8	52.0	11.9	33.3	5.6	52.9	11.1	47.6	5.7	41.2	7.4	19.8	3.2	36.4	4.4	47.3	10.9	32.2	9.6	46.8	10.3	34.8	3.9
18.5	61.8	12.3	42.6	11.1	53.5	12.3	34.2	5.8	54.4	11.4	48.9	5.9	42.3	7.6	20.3	3.2	37.4	4.5	48.6	11.2	33.1	9.9	48.1	10.6	35.5	4.0
19.0	63.5	12.7	43.8	11.4	54.9	12.6	35.1	5.9	55.9	11.7	50.3	6.0	43.4	7.8	20.9	3.3	38.4	4.6	50.0	11.5	34.0	10.2	49.4	10.9	36.2	4.1
19.5	65.1	13.0	44.9	11.7	56.3	12.9	36.1	6.1	57.3	12.0	51.6	6.2	44.6	8.0	21.4	3.4	39.4	4.7	51.3	11.8	34.9	10.4	50.7	11.1	36.9	4.3
20.0	66.8	13.4	46.1	12.0	57.8	13.3	37.0	6.3	58.8	12.3	52.9	6.3	45.7	8.2	21.9	3.5	40.5	4.8	52.6	12.1	35.8	10.7	52.0	11.4	37.6	4.4
20.5	68.4	13.7	47.2	12.3	59.2	13.6	37.9	6.4	60.3	12.6	54.2	6.5	46.9	8.4	22.5	3.6	41.5	5.0	53.9	12.4	36.7	11.0	53.3	11.7	38.3	4.5
21.0	70.1	14.0	48.4	12.6	60.7	13.9	38.8	6.6	61.7	13.0	55.6	6.7	48.0	8.6	23.0	3.7	42.5	5.1	55.2	12.7	37.5	11.3	54.6	12.0	38.9	4.6
21.5	71.8	14.4	49.5	12.9	62.1	14.3	39.8	6.7	63.2	13.3	56.9	6.8	49.2	8.8	23.6	3.8	43.5	5.2	56.5	13.0	38.4	11.5	55.9	12.3	39.6	4.7
22.0	73.5	14.7	50.7	13.2	63.6	14.6	40.7	6.9	64.7	13.6	58.2	7.0	50.3	9.0	24.1	3.9	44.5	5.3	57.9	13.3	39.3	11.8	57.2	12.6	40.3	4.8
22.5	75.1	15.0	51.8	13.5	65.0	14.9	41.6	7.1	66.1	13.9	59.5	7.1	51.5	9.3	24.7	3.9	45.5	5.5	59.2	13.6	40.2	12.1	58.9	12.9	41.0	4.9
23.0	76.8	15.4	53.0	13.8	66.5	15.3	42.5	7.2	67.6	14.2	60.8	7.3	52.6	9.5	25.2	4.0	46.5	5.6	60.5	13.9	41.1	12.3	59.8	13.1	41.7	5.1
23.5	78.5	15.7	54.1	14.1	67.9	15.6	43.5	7.4	69.1	14.5	62.2	7.5	53.7	9.7	25.8	4.1	47.5	5.7	61.8	14.2	42.0	12.6	61.1	13.4	42.4	5.2
24.0	80.2	16.0	55.3	14.4	69.4	15.9	44.4	7.5	70.6	14.8	63.5	7.6	54.9	9.9	26.3	4.2	48.5	5.8	63.1	14.5	42.9	12.9	63.4	13.7	43.1	5.3
24.5	81.8	16.4	56.4	14.7	70.8	16.3	45.3	7.7	72.0	15.1	64.8	7.8	56.0	10.1	26.9	4.3	49.6	5.9	64.4	14.8	43.8	13.1	64.7	14.0	43.8	5.4
25.0	83.5	16.7	57.6	15.0	72.2	16.6	46.2	7.9	72.5	15.4	66.1	7.9	57.2	10.3	27.0	4.4	50.6	6.1	65.7	15.1	44.7	13.4	65.0	14.3	44.5	5.5

* See observations and examples after Cutters.

Lengths of Bowsprits, Booms, Gaffs, and Yards.

OF REVENUE CRUISERS RIGGED AS CUTTERS.*

Dimensions of Vessel.	Main boom.		Gaff.		Trysail gaff.		Bowsprit.		Square-sail yard.		Top-sail yard.		Top-gallant yard.		Square-sail boom.		Ringtail boom.	
Length.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.	1 Example.	2 Example.
50	46.0	43.5	31.3	27.8	18.8	13.9	40.0	39.5	43.5	42.0	31.3	29.4	22.2	18.5	25.7	22.7	27.6	21.7
51	46.9	44.4	31.9	28.4	19.1	14.2	40.8	40.3	44.4	42.8	31.9	30.0	22.6	18.8	26.2	23.1	28.1	22.2
52	47.8	45.2	32.5	28.9	19.5	14.5	41.6	41.1	45.2	43.7	32.6	30.6	23.1	19.2	26.7	23.6	28.7	22.6
53	48.8	46.1	33.1	29.5	19.9	14.7	42.4	41.9	46.1	44.5	33.2	31.2	23.5	19.6	27.2	24.0	29.2	23.0
54	49.7	47.0	33.8	30.1	20.3	15.0	43.2	42.7	47.0	45.4	33.8	31.7	23.9	19.9	27.7	24.5	29.8	23.5
55	50.6	47.8	34.4	30.6	20.6	15.3	44.0	43.4	47.8	46.2	34.4	32.3	24.4	20.3	28.2	24.9	30.4	23.9
56	51.5	48.7	35.0	31.2	21.0	15.6	44.8	44.2	48.7	47.0	35.1	32.9	24.8	20.7	28.7	25.4	30.9	24.3
57	52.4	49.6	35.6	31.7	21.4	15.8	45.6	45.0	49.6	47.9	35.7	33.5	25.3	21.1	29.2	25.8	31.5	24.8
58	53.4	50.5	36.3	32.3	21.8	16.1	46.1	45.8	50.5	48.7	36.3	34.1	25.7	21.4	29.8	26.3	32.0	25.2
59	54.3	51.3	36.9	32.8	22.1	16.4	47.2	46.6	51.3	49.6	36.9	34.7	26.2	21.8	30.3	26.8	32.6	25.6
60	55.2	52.2	37.5	33.4	22.5	16.7	48.0	47.4	52.2	50.4	37.6	35.3	26.6	22.2	30.8	27.2	33.1	26.1
61	56.1	53.1	38.2	34.0	22.9	17.0	48.8	48.2	53.1	51.2	38.2	35.9	27.1	22.5	31.3	27.7	33.7	26.5
62	57.0	53.9	38.8	34.5	23.3	17.2	49.6	49.0	53.9	52.1	38.8	36.4	27.5	22.9	31.8	28.1	34.2	26.9
63	58.0	54.8	39.4	35.1	23.6	17.5	50.4	49.8	54.8	52.9	39.5	37.0	27.9	23.3	32.3	28.6	34.7	27.4
64	58.9	55.7	40.0	35.6	24.0	17.8	51.2	50.6	55.7	53.8	40.1	37.6	28.4	23.6	32.8	29.0	35.3	27.9
65	59.8	56.5	40.7	36.2	24.4	18.1	52.0	51.3	56.5	54.6	40.7	38.2	28.8	24.0	33.3	29.5	35.9	28.2
66	60.7	57.4	41.3	36.7	24.8	18.4	52.8	52.1	57.4	55.4	41.3	38.8	29.3	24.4	33.8	29.9	36.4	28.7
67	61.6	58.3	41.9	37.3	25.1	18.6	53.6	52.9	58.3	56.3	42.0	39.4	29.7	24.8	34.4	30.4	37.0	29.1
68	62.6	59.2	42.5	37.9	25.5	18.9	54.4	53.7	59.2	57.1	42.6	40.0	30.2	25.1	34.9	30.8	37.5	29.6
69	63.5	60.0	43.2	38.4	25.9	19.2	55.2	54.5	60.0	58.0	43.2	40.6	30.6	25.5	35.4	31.3	38.1	30.0
70	64.4	60.9	43.8	39.0	26.3	19.5	56.0	55.3	60.9	58.8	43.8	41.2	31.0	25.9	35.9	31.7	38.6	30.5
71	65.3	61.8	44.4	39.5	26.6	19.7	56.8	56.1	61.8	59.6	44.5	41.7	31.5	26.2	36.4	32.2	39.2	30.9
72	66.2	62.6	45.0	40.1	27.0	20.0	57.6	56.9	62.6	60.5	45.1	42.3	31.9	26.6	36.9	32.6	39.7	31.3
73	67.2	63.5	45.7	40.6	27.4	20.3	58.4	57.7	63.5	61.3	45.7	42.9	32.4	27.0	37.5	33.1	40.3	31.7
74	68.1	64.4	46.3	41.2	27.8	20.6	59.2	58.5	64.4	62.2	46.3	43.5	32.8	27.3	38.0	33.6	40.8	32.2
75	69.0	65.2	46.9	41.8	28.1	20.9	60.0	59.2	65.2	63.0	47.0	44.1	33.3	27.7	38.5	34.0	41.4	32.6
76	69.9	66.1	47.5	42.3	28.5	21.1	60.8	60.0	66.1	63.8	47.6	44.7	33.7	28.1	39.0	34.5	41.9	33.1
77	70.8	67.0	48.2	42.9	28.9	21.4	61.6	60.8	67.0	64.7	48.2	45.3	34.2	28.4	39.5	34.9	42.5	33.5
78	71.8	67.9	48.8	43.4	29.2	21.7	62.4	61.6	67.9	65.5	48.8	45.9	34.6	28.8	40.0	35.4	43.0	33.9
79	72.7	68.7	49.4	44.0	29.6	22.0	63.2	62.4	68.7	66.4	49.5	46.4	35.0	29.2	40.5	35.8	43.6	34.3
80	73.6	69.6	50.0	44.5	30.0	22.3	64.0	63.2	69.6	67.2	50.1	47.0	35.5	29.6	41.1	36.3	44.2	34.8
81	74.5	70.5	50.7	45.1	30.4	22.5	64.8	64.0	70.5	68.0	50.7	47.6	35.9	29.9	41.6	36.7	44.7	35.2
82	75.4	71.3	51.3	45.6	30.8	22.8	65.6	64.8	71.3	68.9	51.4	48.2	36.4	30.3	42.1	37.2	45.3	35.6
83	76.4	72.2	51.9	46.2	31.1	23.1	66.4	65.6	72.2	69.7	51.9	48.8	36.8	30.7	42.6	37.6	45.8	36.1
84	77.3	73.1	52.5	46.8	31.5	23.4	67.2	66.4	73.1	70.6	52.6	49.4	37.3	31.0	43.1	38.1	46.4	36.5
85	78.2	73.9	53.2	47.3	31.9	23.6	68.0	67.1	73.9	71.4	53.2	50.0	37.7	31.4	43.6	38.5	46.9	36.9

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* The dimensions and proportions in the Tables for Revenue Cruisers, are given after a comparison made on several of this class of vessels that were considered, according to the idea of the most experienced cutter sailors, to have been the best masted; but we find their dimensions considerably short of the yachts.

Lengths of Bowsprits, Booms, Gaffs, and Yards.

YACHTS RIGGED AS CUTTERS.

Dimensions of Vessel.	Main-boom.			Mizen boom	Main-gaff.			Mizen gaff.		Bowsprit.*			Square-sail-yard.			Top-sail-yard.			Top-gallant-yard.			Square-sail-boom.			Ringtail-boom.		Yawls.	
Length.	1st Example.	2nd Example.	3rd Example.	As Ketch.	2nd Example.	1st Example.	3rd Example.	As Ketch.	As Yawls.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	Outrigger.	Mizen-yard.
45	42.1	37.3	22.5	22.5	26.4	28.1	22.5	11.2	21.5	37.1	28.1	36.0	36.0	35.1	36.0	25.2	21.8	25.2	18.0	15.7	18.0	20.3	18.7	17.6	25.2	21.5	24.7	20.4
46	43.0	38.2	23.0	23.0	27.0	28.7	23.0	11.5	21.9	37.9	28.8	36.8	36.8	35.9	36.8	25.8	22.2	25.8	18.4	16.1	18.4	20.8	19.1	18.0	25.8	22.0	25.3	20.8
47	43.9	39.2	23.5	23.5	27.6	29.3	23.5	11.7	22.4	38.8	29.4	37.6	37.6	36.7	37.6	26.3	22.7	26.3	18.8	16.5	18.8	21.3	19.5	18.4	26.4	22.4	25.8	21.2
48	44.9	40.1	24.0	24.0	28.2	29.9	24.0	12.0	22.9	39.6	30.0	38.4	38.4	37.4	38.4	26.9	23.2	26.9	19.2	16.8	19.2	21.7	20.0	18.8	26.9	22.9	26.4	21.7
49	45.8	41.1	24.5	24.5	28.7	30.6	24.5	12.2	23.3	40.4	30.7	39.2	39.2	38.2	39.2	27.4	23.7	27.4	19.6	17.2	19.6	22.2	20.4	19.2	27.5	23.4	26.9	22.2
50	46.8	42.0	25.0	25.0	29.3	31.2	25.0	12.5	23.8	41.2	31.3	40.4	40.4	39.0	40.4	28.0	24.2	28.0	20.0	17.5	20.0	22.6	20.8	19.6	28.1	23.9	27.5	22.6
51	47.7	43.0	25.5	25.5	29.9	31.8	25.5	12.7	24.3	42.0	32.0	40.8	40.8	39.8	40.8	28.6	24.6	28.6	20.4	17.9	20.4	23.1	21.2	20.0	28.6	24.3	28.0	23.1
52	48.7	43.9	36.0	26.0	30.5	32.4	26.0	13.0	24.8	42.9	32.6	41.6	41.6	40.6	41.6	29.1	25.1	29.1	20.8	18.2	20.6	23.5	21.6	20.3	29.2	24.8	28.6	23.6
53	49.6	44.9	26.5	26.5	31.1	33.1	26.5	13.2	25.3	43.7	33.3	42.4	42.4	41.3	42.4	29.7	25.6	29.7	21.2	18.6	21.2	24.0	22.0	20.8	29.8	25.3	29.1	24.0
54	50.5	45.8	27.0	27.0	31.7	33.7	27.0	13.5	25.9	44.5	33.9	43.2	43.2	42.1	43.2	30.2	26.1	30.2	21.6	19.0	21.6	24.4	22.5	21.2	30.3	25.8	29.7	24.4
55	51.5	46.8	27.5	27.5	32.3	34.3	27.5	13.7	26.3	45.4	34.6	44.0	44.0	42.9	44.0	30.8	26.6	30.8	22.0	19.3	22.0	24.9	22.9	21.6	30.9	26.3	30.2	24.9
56	52.4	47.7	28.0	28.0	32.9	34.9	28.0	14.0	26.7	46.2	35.2	44.8	44.8	43.7	44.8	31.4	27.1	31.4	22.4	19.8	22.4	25.3	23.3	21.9	31.4	26.7	30.8	25.4
57	53.3	48.7	28.5	28.5	33.4	35.6	28.5	14.2	27.2	47.0	35.9	45.6	45.6	44.5	45.6	31.9	27.6	31.9	22.8	20.0	22.8	25.8	23.7	22.3	32.0	27.2	31.3	25.8
58	54.3	49.7	29.0	29.0	34.0	36.2	29.0	14.5	27.7	47.8	36.5	46.4	46.4	45.2	46.4	32.5	28.1	32.5	23.2	20.4	23.2	26.2	24.1	22.7	32.6	27.7	31.9	26.3
59	55.2	50.6	29.5	29.5	34.6	36.8	29.5	14.7	28.1	48.7	37.2	47.2	47.2	46.0	47.2	33.0	28.5	33.0	23.6	20.7	23.6	26.7	24.5	23.1	33.1	28.2	32.4	26.7
60	56.2	51.6	30.0	30.0	35.2	37.4	30.0	15.0	28.6	49.5	37.8	48.0	48.0	46.8	48.0	33.6	29.0	33.6	24.0	21.1	24.0	27.1	24.9	23.5	33.7	28.6	33.0	27.2
61	57.1	52.5	30.5	30.5	35.8	38.0	30.5	15.2	29.1	50.3	38.5	48.8	48.8	47.6	48.8	34.2	29.5	34.2	24.4	21.4	24.4	27.6	25.4	23.9	34.2	29.1	33.5	27.6
62	58.0	53.5	31.0	31.0	36.4	38.7	31.0	15.5	29.6	51.1	39.1	49.6	49.6	48.4	49.6	34.7	29.9	34.7	24.8	21.8	24.8	28.0	25.8	24.3	34.8	29.6	34.1	28.1
63	59.0	54.4	31.5	31.5	37.0	39.3	31.5	15.7	30.1	52.0	39.8	50.4	50.4	49.1	50.4	35.3	30.5	35.3	25.2	22.1	25.2	28.5	26.2	24.7	35.4	30.1	34.6	28.5
64	59.9	55.4	32.0	32.0	37.5	39.9	32.0	16.0	30.5	52.8	40.4	51.2	51.2	49.9	51.2	35.8	31.0	35.8	25.6	22.5	25.6	28.9	26.6	25.1	35.9	30.6	35.2	29.0
65	60.8	56.3	32.5	32.5	38.1	40.5	32.5	16.2	31.0	53.6	41.0	52.0	52.0	50.7	52.0	36.4	31.4	36.4	26.0	22.8	26.0	29.4	27.0	25.5	36.5	31.0	35.7	29.4

* Example 2 is the short or winter bowsprit; Example 3 is the nearest to what is commonly given.

Lengths of Bowsprits, Booms, Gaffs, and Yards. (Continued.)

Dimensions of Vessel.	YACHTS RIGGED AS CUTTERS.																																	
	Main-boom.*			Mizen boom.	Main-gaff.			Mizen-gaff.		Bowsprit.			Square-sail-yard.			Top-sail-yard.			Top-gallant-yard.			Square-sail boom.			Ringtail-boom.		Yawls.	
	1st Example.	2nd Example.	3rd Example.	As Ketch.	2nd Example.	1st Example.	3rd Example.	As Ketch.	As Yawls.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	3rd Example.	1st Example.	2nd Example.	Outrigger.	Mizen-yard.
Length.																												
66	61.8	57.3	33.0	33.0	38.7	41.2	33.0	16.5	31.5	54.4	41.7	52.8	52.8	51.5	52.8	37.0	31.9	37.0	26.4	23.2	26.4	29.8	27.4	25.9	37.1	31.5	36.3	29.9
67	62.7	58.2	33.5	33.5	39.3	41.8	33.5	16.7	32.0	55.3	42.3	53.6	53.6	52.3	53.6	37.5	32.4	37.5	26.8	23.5	26.8	30.3	27.9	26.2	37.6	32.0	36.8	30.3
68	63.6	59.2	34.0	34.0	39.9	42.4	34.0	17.0	32.5	56.1	43.0	54.4	54.4	53.0	54.4	38.1	32.9	38.1	27.2	23.9	27.2	30.8	28.3	26.6	38.2	32.5	37.4	30.8
69	64.6	60.2	34.5	34.5	40.5	43.0	34.5	17.2	32.9	56.9	43.6	55.2	55.2	53.8	55.2	38.6	33.4	38.6	27.6	24.2	27.6	31.2	28.7	27.0	38.7	32.9	37.9	31.2
70	65.5	61.1	35.0	35.0	41.1	43.7	35.0	17.5	33.4	57.7	44.3	56.0	56.0	54.6	56.0	39.2	33.9	39.2	28.0	24.6	28.0	31.7	29.1	27.4	39.2	33.4	38.5	31.7
71	66.4	62.1	35.5	35.5	41.7	44.3	35.5	17.7	33.9	58.6	44.9	56.8	56.8	55.4	56.8	39.8	34.3	39.8	28.4	24.9	28.4	32.1	29.5	27.8	39.8	33.9	39.0	32.1
72	67.4	63.0	36.0	36.0	42.2	44.9	36.0	18.0	34.4	59.4	45.6	57.6	57.6	56.2	57.6	40.3	34.8	40.3	28.8	25.3	28.8	32.6	29.9	28.2	40.3	34.4	39.6	32.6
73	68.3	64.0	36.5	36.5	42.8	45.5	36.5	18.2	34.8	60.2	46.2	58.4	58.4	56.9	58.4	40.9	35.3	40.9	29.2	25.6	29.2	33.0	30.4	28.6	40.9	34.8	40.1	33.1
74	69.3	64.9	37.0	37.0	43.4	46.2	37.0	18.5	35.3	61.0	46.9	59.2	59.2	57.7	59.2	41.4	35.8	41.4	29.6	26.0	29.6	33.5	30.8	29.0	41.4	35.3	40.7	33.5
75	70.1	65.9	37.5	37.5	44.0	46.3	37.5	18.7	36.8	61.9	47.5	60.0	60.0	58.6	60.0	42.0	36.3	42.0	30.0	26.3	30 0	33.9	31.2	29.4	42.0	35.8	41.2	34.0
76	71.0	66.8	38.0	38.0	44.6	47.4	38.0	19.0	36.3	62.7	48.2	60.8	60.8	59.3	60.8	42.6	36.8	42.6	30.4	26.7	30.4	34.4	31.6	29.8	42.6	36.3	41.7	34.4
77	71.9	67.8	38.5	38.5	45.2	48.0	38.5	19.2	36.7	63.5	48.8	61.6	61.6	60.1	61.6	43.1	37.2	43.1	30.8	27.0	30.8	34.8	32.0	30.2	43.2	36.7	42.3	34.9
78	72.9	68.8	39.0	39.0	45.8	48.7	39.0	19.5	37.2	64.3	49.5	62.4	62.4	60.8	62.4	43.7	37.7	43.7	31.2	27.4	31.2	35.3	32.4	30.6	43.8	37.2	42.8	35.3
79	73.8	69.7	39.5	39.5	46.4	49.3	39.5	19.7	37.7	65.2	50.1	63.2	63.2	61.6	63.2	44.2	38.2	44.2	32.6	27.7	31.6	35.7	32.9	31.0	44.3	37.7	43.4	35.8
80	74.8	70.6	40.0	40.0	46.9	49.9	40.0	20.0	38.2	66.0	50.8	64.0	64.0	62.4	64.0	44.8	38.7	44.8	32.0	28.1	32.0	36.2	33.3	31.3	44.9	38.2	43.9	36.2
81	75.7	71.6	40.5	40.5	47.5	50.5	40.5	20.2	38.6	66.8	51.4	64.8	64.8	63.2	64.8	45.4	39.2	45.4	32.4	28.4	32.4	36.6	33.7	31.7	45.4	38.7	44.5	36.7
82	76.6	72.5	41.0	41.0	48.1	51.1	41.0	20.5	39.1	67.6	52.0	65.6	65.6	64.0	65.6	45.9	39.7	45.9	32.8	28.8	32.8	37.1	34.1	32.1	46.0	39.1	45.0	37.1
83	77.6	73.5	41.5	41.5	48.7	51.8	41.5	20.7	39.6	68.5	52.7	66.4	66.4	64.7	66.4	46.5	40.1	46.5	33.2	29.1	33.2	37.5	34.5	32.5	46.6	39.6	45.6	37.6
84	78.6	74.4	42.0	42.0	49.3	52.4	42.0	21.0	40.1	69.3	53.3	67.2	67.2	65.5	67.2	47.0	40.6	47.0	33.6	29.5	33.6	38.0	34.9	32.9	47.2	40.1	46.1	38.0
85	79.6	75.4	42.5	42.5	49.9	53.0	42.5	21.2	40.5	70.1	54.0	68.0	68.0	66.3	68.0	47.6	41.1	47.6	34.0	29.8	34.0	38.4	35.4	33.3	47.7	40.6	46.7	38.5

* We find a great difference in the lengths of main-booms when compared with the length of the vessel; this is owing to the position of the masts, as several yachts have their masts very far aft, while the lengths here are determined with the masts placed as given in the proportions.

Proportions for Masts, Yards, Booms, &c. of Schooners.

Length. Breadth. Ketch .... 78.2 ft. 21.0 ft. Schooner, three masts 78.7 ft. 21.6 ft. Ditto, brig for. Ex. 1. 110.6 ft. 25.6 ft. Ditto ditto, Ex. 2. 102.5 ft. 25.8 ft. Ditto common ...... 90.0 ft. 24.0 ft. Ditto Bermuda, Ex. 1. 95.0 ft. 24.7 ft. Ditto ditto, Ex. 2. 94.7 ft. 24.0 ft.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.						
		Ketch.	Schooners.			Schooners.		
			Three Masts.	Brig forward.		Common.	Bermuda.	
				1 Ex.	2 Ex.		1 Ex.	2 Ex.
Main-mast hounded	Breadth	2.7	2.78	3.11	3.1	2.61	2.75	2.83
Main-mast headed	Hounded length	.193	.1	.13	1.3	.12	.13	.13
Fore-mast hounded	Main-mast hounded ...	—	.95	.734	.61	.92	.97	.91
Fore-mast headed	Hounded length	—	.1	.193	.193	.12	.13	.13
Mizen-mast hounded	Main-mast hounded....	.7	.74	—	—	—	—	—
Mizen-mast headed	Hounded length	.16	.1	—	—	—	—	—
Main-top-mast hounded	Breadth	1.4	.25	1.1	1.2	.83	1.0	.99
Main-top-mast pole	Hounded length	.156	.31	.43	.43	.5	.5	.52
Fore-top-mast hounded	Main-top-mt. hounded	—	.92	1.08	1.2	1.0	.9	1.0
Fore-top-mast headed	Hounded length......	—	.31	.156	.156	.5	.5	.54
Mizen-top-mast hounded...........	Main-top-mt. hounded	.8	.9	—	—	—	—	—
Mizen-top-mast pole...............	Hounded length......	.16	.24	—	—	—	—	—
Fore-top-gallant-mast hounded......	Breadth	.8	—	.77	.79	—	—	—
Fore-top-gallant-mast pole	Hounded length......	.66	—	.55	.55	—	—	—
Bowsprit	Fore-mast	.72	.35	.55	.7	.49	.45	.5
Fore-yard.........................	Length	.68	.5	.575	.61	.572	.48	.56
Fore-top-sail-yard.................	Fore-yard...........	.7	.7	.736	.764	.71	.747	.585
Fore-top-gallant-yard	Ditto..........	.461	.48	.574	.66	.458	.483	.422
Fore royal-yard	Top-gallant-yard	—	—	.8	.7	—	—	—
Square-sail-yard...................	Length	—	.5	.44	.57	.52	.44	.47
Main-top-sail-yard.................	Square-sail-yard......	—	.607	.75	.64	.77	.75	.64
Main-top-gallant-yard	Ditto...	—	—	.48	.46	.5	.48	.46
Main-boom	Length	—	.226	.586	.6	.7	.66	.68
Main-gaff.........................	Boom	—	—	.586	.72	.53	.44	.48
Fore-gaff	Main-gaff...........	—	1.06	1.0	1.0	.73	1.0	.10
Mizen-gaff	Ditto..............	—	.9	—	—	—	—	—
Mizen or driver-boom	Length	.44	.39	—	—	—	—	—
Cross-jack-yard	Fore-yard	.56	—	—	—	—	—	—
Mizen-top-sail-yard	Cross-jack yard	.7	—	—	—	—	—	—
Jib-boom	Bowsprit...........	.6	.97	1.21	—	.87	1.3	1.2
Flying jib-boom, before jib-boom....	Jib-boom	—	.4	.4	—	—	—	—
Swinging ditto	Fore-yard..........	—	.5	.68	.68	—	—	—
Ringtail ditto	Length	—	.21	—	—	—	—	—
Square-sail ditto	Ditto.............	—	.22	—	—	.4	.37	.44
Fore-gaff.........................	Length............	.4	—	—	—	—	—	—
Driver-gaff	Fore gaff	.59	—	—	—	—	—	—
		before	abaft	abaft				
Main-mast from the middle	Length of water-line ..	.11	.033	.11	.107	.046	.106	.084
Fore-mast before ditto	Ditto	—	.295	.3	.294	.338	.279	.31
Mizen-mast abaft ditto	Ditto	.395	.366	—	—	—	—	—
Main-mast to rake	In 12 feet	12 in.	27 in.	33 in.	28 in.	24 in.	24 in.	33 in.
Fore mast ditto	Ditto.............	—	24 in.	28 in.	18 in.	15 in.	16 in.	36 in.
Mizen-mast ditto	Ditto	18 in.	30 in.	—	—	—	—	—
Bowsprit to stive	Ditto.............	36 in.	22 in.	36 in.	33 in.	34 in.	24 in.	22 in.
Main-mast below the load-water-line	Breadth	.32	.227	.26	.3	.26	.31	.31
Fore-mast below the load-water-line	....	.3	.17	.22	.217	.22	.27	.21
Mizen-mast below the load-water-line		—	.232	—	—	—	—	—
Centre of effort from the middle of the length of the water-line	Length on water-line	.042	.0065	.0163	.015	.02	.023	.025
Height of the centre of effort above the load-water-line	Breadth............×	1.74	1.539	1.72	1.6	1.5	1.5	1.56
Area of sails	Area of load-water section .... ×	4.7	4.944	4.59	4.62	3.63	3.54	3.61
Moment of sails	Ditto............×	172.5	164.4	204.	96.	138.0	128.6	132.5
Bowsprit housed fom the fore part of the stern	Breadth	.5	.32	.35	.407	.46	.442	.43
Difference of draught of water, excess aft	....	9 in.	36 in.	24 in.	28 in.	12 in.	24 in.	48 in.

Lengths of Lower-masts, Top-masts, Bowsprits, and Jib-booms.

Dimensions of Vessel.	BERMUDA SCHOONER.																				COMMON SCHOONER.									
	FIRST EXAMPLE.										SECOND EXAMPLE.																			
	Main-mast.		Fore-mast.		Main Top-mast.		Fore Top-mast.		Bowsprit	Jib-boom	Main-mast.		Fore-mast.		Main Top-mast.		Fore Top-mast.		Bowsprit	Jib-boom	Main-mast.		Fore-mast.		Main Top-mast.		Fore Top-mast.		Bowsprit	Jib-boom
Breadth	Hounded	Headed	Hounded	Headed	Hounded	Pole	Hounded	Pole			Hounded	Headed	Hounded	Headed	Hounded	Pole	Hounded	Pole			Hounded	Headed	Hounded	Headed	Hounded	Pole	Hounded	Pole		
Feet.																														
12.0	33.0	4.3	32.0	4.2	12.2	6.1	11.0	5.5	14.4	17.8	34.0	4.4	30.9	4.1	11.9	6.2	11.9	6.4	15.4	18.5	31.3	3.7	28.8	3.4	10.0	5.0	10.0	5.0	14.1	12.3
12.5	34.4	4.5	33.3	4.3	12.7	6.3	11.4	5.7	15.0	18.6	35.4	4.6	32.2	4.3	12.4	6.4	12.4	6.7	16.1	19.3	32.6	3.9	30.0	3.6	10.4	5.2	10.4	5.2	14.7	12.8
13.0	35.7	4.6	34.7	4.5	13.2	6.6	11.9	5.9	15.6	19.3	36.8	4.8	33.5	4.5	12.9	6.7	12.9	6.9	16.7	20.1	33.9	4.1	31.2	3.7	10.8	5.4	10.8	5.4	15.3	13.3
13.5	37.1	4.8	36.0	4.7	13.7	6.9	12.4	6.2	16.2	20.0	38.2	5.0	34.8	4.6	13.4	6.9	13.4	7.2	17.4	20.8	35.2	4.2	32.4	3.9	11.3	5.6	11.3	5.6	15.9	13.8
14.0	38.5	5.0	37.3	4.8	14.2	7.1	12.8	6.4	16.8	20.8	39.6	5.1	36.0	4.8	13.9	7.2	13.9	7.5	18.0	21.6	36.5	4.4	33.6	4.0	11.7	5.8	11.7	5.8	16.5	14.3
14.5	39.9	5.2	38.7	5.0	14.7	7.4	13.3	6.6	17.4	21.5	41.0	5.3	37.3	5.0	14.4	7.5	14.4	7.7	18.6	22.4	37.8	4.5	34.8	4.2	12.1	6.0	12.1	6.0	17.1	14.8
15.0	41.2	5.4	40.0	5.2	15.3	7.6	13.7	6.9	18.0	22.3	42.4	5.5	38.6	5.2	14.8	7.7	14.8	8.0	19.3	23.2	38.1	4.7	36.0	4.4	12.5	6.3	12.5	6.3	17.6	15.3
15.5	42.6	5.5	41.3	5.4	15.8	7.9	14.2	7.1	18.6	23.0	43.9	5.7	39.9	5.4	15.3	8.0	15.3	8.3	19.9	23.9	40.4	4.8	37.2	4.5	12.9	6.5	12.9	6.5	18.2	15.9
16.0	44.0	5.7	42.7	5.5	16.3	8.1	14.6	7.3	19.2	23.8	45.3	5.9	41.2	5.5	15.8	8.3	15.8	8.5	20.6	24.7	41.7	5.0	38.4	4.6	13.3	6.7	13.3	6.7	18.8	16.4
16.5	45.4	5.9	44.0	5.7	16.8	8.4	15.1	7.5	19.8	24.5	46.7	6.1	42.5	5.7	16.3	8.5	16.3	8.8	21.2	25.5	43.1	5.2	39.6	4.7	13.8	6.8	13.8	6.8	19.4	16.9
17.0	46.7	6.1	45.3	5.9	17.3	8.6	15.6	7.8	20.4	25.2	48.1	6.2	43.8	5.9	16.8	8.7	16.8	9.1	21.9	26.3	44.4	5.3	40.8	4.9	14.2	7.1	14.2	7.1	20.0	17.4
17.5	48.1	6.2	46.7	6.1	17.8	8.9	16.0	8.0	21.0	26.0	49.5	6.4	45.1	6.1	17.3	9.0	17.3	9.4	22.5	27.0	45.7	5.5	42.0	5.0	14.6	7.3	14.6	7.3	20.6	17.9
18.0	49.5	6.4	48.0	6.2	18.3	9.1	16.5	8.2	21.6	26.7	50.9	6.6	46.3	6.2	17.8	9.3	17.8	9.6	23.2	27.8	47.0	5.6	43.2	5.2	15.0	7.5	15.0	7.5	21.2	18.4
18.5	50.9	6.6	49.3	6.4	18.8	9.4	16.9	8.5	22.2	27.5	52.3	6.8	47.6	6.4	18.3	9.5	18.3	9.9	23.8	28.6	48.3	5.8	44.4	5.3	15.4	7.7	15.4	7.7	21.8	18.9
19.0	52.2	6.8	50.7	6.6	19.3	9.7	17.4	8.7	22.8	28.2	53.8	7.0	48.9	6.6	18.8	9.8	18.8	10.2	24.5	29.3	49.6	5.9	45.6	5.5	15.8	7.9	15.8	7.9	22.3	19.4
19.5	53.6	7.0	52.0	6.8	19.8	9.9	17.8	8.9	23.4	28.9	55.2	7.2	50.2	6.7	19.3	10.0	19.3	10.4	25.1	30.1	50.9	6.1	46.8	5.6	16.2	8.1	16.2	8.1	22.9	20.0
20.0	55.0	7.1	53.3	6.9	20.3	10.2	18.3	9.2	24.0	29.7	56.6	7.3	51.5	6.9	19.8	10.3	19.8	10.7	25.7	30.9	52.2	6.3	48.0	5.8	16.7	8.3	16.7	8.3	23.5	20.5
20.5	56.4	7.3	54.7	7.1	20.8	10.4	18.8	9.4	24.6	30.4	58.0	7.5	52.8	7.1	20.3	10.5	20.3	11.0	26.4	31.7	53.5	6.4	49.2	5.9	17.1	8.6	17.1	8.6	24.1	21.0
21.0	57.7	7.5	56.0	7.3	21.4	10.7	19.2	9.6	25.2	31.2	59.4	7.7	54.1	7.3	20.8	10.8	20.8	11.2	27.0	32.4	54.8	6.6	50.4	6.0	17.5	8.8	17.5	8.8	24.7	21.5
21.5	59.1	7.7	57.3	7.4	21.9	10.9	19.7	9.8	25.8	31.9	60.8	7.9	55.4	7.5	21.3	11.1	21.3	11.5	27.7	33.2	56.1	6.7	51.6	6.2	17.9	9.0	17.9	9.0	25.3	22.0
22.0	60.5	7.9	58.6	7.6	22.4	11.2	20.1	10.1	26.4	32.7	62.3	8.1	56.6	7.6	21.8	11.3	21.8	11.8	28.3	34.0	57.4	6.9	52.8	6.3	18.4	9.2	18.4	9.2	25.9	22.5
22.5	61.9	8.0	60.0	7.8	22.9	11.4	20.6	10.3	27.0	33.4	63.7	8.3	57.9	7.8	22.3	11.6	22.3	12.0	29.0	34.8	58.7	7.0	54.0	6.5	18.8	9.4	18.8	9.4	26.5	23.0
23.0	63.2	8.2	61.3	7.9	23.4	11.7	21.1	10.5	27.6	34.1	65.1	8.4	59.2	8.0	22.8	11.8	22.8	12.3	29.6	35.5	60.0	7.2	55.2	6.6	19.2	9.6	19.2	9.6	27.1	23.5
23.5	64.6	8.4	62.7	8.1	23.9	11.9	21.5	10.8	28.2	34.9	66.5	8.6	60.5	8.1	23.3	12.1	23.3	12.6	30.2	36.3	61.3	7.3	56.4	6.8	19.6	9.8	19.6	9.8	27.6	24.0
24.0	66.0	8.6	64.0	8.3	24.4	12.2	22.0	11.0	28.8	35.6	67.9	8.8	61.8	8.3	23.8	12.4	23.8	12.8	30.9	37.1	62.6	7.5	57.6	6.9	20.0	10.0	20.0	10.0	28.2	24.6
24.5	67.4	8.7	65.3	8.5	24.9	12.5	22.4	11.2	29.4	36.4	69.3	9.0	63.1	8.5	24.3	12.6	24.3	13.1	31.5	37.8	63.9	7.7	58.8	7.0	20.5	10.2	20.5	10.2	28.8	25.1
25.0	68.7	8.9	66.7	8.7	25.4	12.7	22.9	11.4	30.0	37.1	70.7	9.2	64.4	8.7	24.8	12.9	24.8	13.4	32.2	38.6	65.2	7.8	60.0	7.2	20.8	10.4	20.8	10.4	29.4	25.6

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, and Jib-booms.

Breadth of Vessel.	RIGGED FORWARD AS A BRIG, AND AFT AS A SCHOONER.											
	FIRST EXAMPLE.											
	Main-mast.		Fore-mast.		Main-top-mast.		Fore-top-mast.		Fore-top-gallant-mast.		Bowsprit.	Jib-boom.
	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Headed.	Hounded.	Pole.		
17.0	52.9	6.9	38.8	7.5	18.7	8.0	20.2	3.1	13.1	7.2	21.3	26.
17.5	54.4	7.1	39.9	7.7	19.2	8.3	20.8	3.2	13.5	7.4	22.0	27.
18.0	56.0	7.3	41.1	7.9	19.8	8.5	21.4	3.3	13.9	7.6	22.6	27.
18.5	57.5	7.5	42.2	8.1	20.3	8.7	22.0	3.4	14.2	7.8	23.2	28.
19.0	59.1	7.7	43.4	8.4	20.9	9.0	22.6	3.5	14.6	8.0	23.8	29.
19.5	60.6	7.9	44.5	8.6	21.4	9.2	23.2	3.6	15.0	8.2	24.5	30.
20.0	62.2	8.1	45.6	8.8	22.0	9.5	23.8	3.7	15.4	8.5	25.1	30.
20.5	63.7	8.3	46.8	9.0	22.5	9.7	24.3	3.8	15.8	8.7	25.7	31.
21.0	65.3	8.5	47.9	9.2	23.1	9.9	24.9	3.9	16.2	8.9	26.4	32.
21.5	66.0	8.7	49.1	9.5	23.6	10.2	25.5	4.0	16.5	9.1	27.0	33.
22.0	68.4	8.9	50.2	9.7	24.2	10.4	26.1	4.1	16.9	9.3	27.6	33.
22.5	70.0	9.1	51.4	9.9	24.7	10.6	26.7	4.2	17.3	9.5	28.2	34.
23.0	71.5	9.3	52.5	10.1	25.3	10.9	27.3	4.3	17.7	9.7	28.9	35.
23.5	73.1	9.5	53.6	10.3	25.8	11.1	27.9	4.3	18.1	9.9	29.5	36.
24.0	74.6	9.7	54.8	10.6	26.4	11.3	28.5	4.4	18.5	10.2	30.1	36.
24.5	76.2	9.9	55.9	10.8	26.9	11.6	29.1	4.5	18.9	10.4	30.7	37.
25.0	77.7	10.1	57.1	11.0	27.5	11.8	29.7	4.6	19.2	10.6	31.4	38.
25.5	79.3	10.3	58.2	11.2	28.0	12.1	30.3	4.7	19.6	10.8	32.0	39.
26.0	80.9	10.5	59.3	11.4	28.6	12.3	30.9	4.8	20.0	11.0	32.6	39.
26.5	82.4	10.7	60.5	11.7	29.1	12.5	31.5	4.9	20.4	11.2	33.2	40.
27.0	84.0	10.9	61.6	11.9	29.7	12.8	32.1	5.0	20.8	11.4	33.9	41.

Breadth of Vessel.	RIGGED FORWARD AS A BRIG, AND AFT AS A SCHOONER.										
	SECOND EXAMPLE.										
	Main-mast.		Fore-mast.		Main-top-mast.		Fore-top-mast.		Fore-top-gallant-mast.		Bowsprit.
	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Headed.	Hounded.	Pole.	
17.0	52.7	6.8	32.1	6.2	20.4	8.8	24.5	3.8	13.4	7.4	22.5
17.5	54.0	7.0	33.1	6.4	21.0	9.0	25.2	3.9	13.8	7.6	23.2
18.0	55.8	7.2	34.4	6.6	21.6	9.3	25.9	4.0	14.2	7.8	23.8
18.5	57.3	7.4	35.0	6.7	22.2	9.5	26.6	4.1	14.6	8.0	24.5
19.0	58.9	7.6	35.9	6.9	22.8	9.8	27.4	4.3	15.0	8.2	25.1
19.5	60.4	7.8	36.9	7.1	23.4	10.1	28.1	4.4	15.4	8.5	25.8
20.0	62.0	8.1	37.8	7.2	24.0	10.3	28.8	4.5	15.8	8.7	26.5
20.5	63.5	8.3	38.8	7.5	24.6	10.6	29.5	4.6	16.2	8.9	27.1
21.0	65.1	8.5	39.7	7.7	25.2	10.8	30.2	4.7	16.6	9.1	27.8
21.5	66.6	8.7	40.6	7.8	25.8	11.1	31.0	4.8	17.0	9.3	28.5
22.0	68.2	8.9	41.6	8.0	26.4	11.3	31.7	4.9	17.4	9.5	29.1
22.5	69.7	9.1	42.5	8.2	27.0	11.6	32.4	5.0	17.8	9.8	29.8
23.0	71.3	9.3	43.5	8.4	27.6	11.9	33.1	5.2	18.2	10.0	30.4
23.5	72.8	9.5	44.4	8.6	28.2	12.1	33.8	5.3	18.6	10.2	31.1
24.0	74.4	9.7	45.4	8.8	28.8	12.4	34.6	5.4	19.0	10.4	31.8
24.5	75.9	9.9	46.3	8.9	29.4	12.6	35.3	5.5	19.4	10.6	32.4
25.0	77.5	10.1	47.3	9.1	30.0	12.9	36.0	5.6	19.8	10.9	33.1
25.5	79.0	10.3	48.2	9.3	30.6	13.1	36.7	5.7	20.1	11.1	33.7
26.0	80.6	10.5	49.2	9.5	31.2	13.4	37.4	5.8	20.5	11.3	34.4
26.5	82.1	10.7	50.1	9.7	31.8	13.7	38.2	5.9	20.9	11.5	35.1
27.0	83.7	10.9	51.0	9.8	32.4	13.9	38.9	6.1	21.3	11.7	35.7

Breadth of Vessel.	KETCH.										
	Main-mast.		Mizen or driver-mast.		Main-top-mast.		Main-top-gallant-mast.		Mizen-top-mast.		Bowsprit.
	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	
17.0	42.8	9.6	32.1	5.1	21.3	3.3	13.6	9.0	19.5	3.1	31.1
17.5	43.2	9.9	33.1	5.3	22.0	3.4	14.0	9.2	20.0	3.2	32.1
18.0	44.5	10.2	34.0	5.4	22.8	3.5	14.4	9.5	20.6	3.3	33.0
18.5	45.9	10.5	35.0	5.6	23.5	3.7	14.8	9.8	21.2	3.4	34.0
19.0	47.2	10.9	35.9	5.7	24.3	3.8	15.2	10.0	21.8	3.5	35.0
19.5	48.6	11.2	36.8	5.9	25.0	3.9	15.6	10.3	22.4	3.6	36.0
20.0	49.9	11.5	37.8	6.0	25.8	4.0	16.0	10.6	22.9	3.7	36.9
20.5	51.3	11.8	38.7	6.2	26.5	4.1	16.4	10.8	23.5	3.7	37.9
21.0	52.6	12.1	39.7	6.3	27.2	4.2	16.8	11.1	24.1	3.8	38.9
21.5	54.0	12.4	40.6	6.5	27.8	4.3	17.2	11.4	24.7	3.9	39.8
22.0	55.3	12.7	41.6	6.6	28.6	4.5	17.6	11.6	25.3	4.0	40.8
22.5	56.7	13.0	42.5	6.8	29.3	4.6	18.0	11.9	25.8	4.1	41.8
23.0	58.0	13.3	43.5	6.9	30.0	4.7	18.4	12.2	26.4	4.2	42.8
23.5	59.4	13.7	44.4	7.1	30.8	4.8	18.8	12.4	27.0	4.3	43.7
24.0	60.7	14.0	45.4	7.2	31.5	4.9	19.2	12.7	27.6	4.4	44.7
24.5	62.1	14.3	46.3	7.4	32.2	5.0	19.6	12.9	28.2	4.5	45.7
25.0	63.4	14.6	47.2	7.6	32.9	5.1	20.0	13.2	28.7	4.6	46.6
25.5	64.8	14.9	48.2	7.7	33.6	5.2	20.4	13.5	29.3	4.7	47.6
26.0	66.1	15.2	49.2	7.9	34.3	5.3	20.8	13.7	29.9	4.8	48.6
26.5	67.5	15.5	50.1	8.0	35.1	5.5	21.2	14.0	30.5	4.8	49.6
27.0	68.8	15.8	51.0	8.2	35.8	5.6	21.6	14.3	31.0	4.9	50.5

KETCH.

Length of Vessel.	Driver Boom.	GAFFS.		MAIN-YARDS.			DRIVER-YARDS.	
		Main.	Driver.	Lower.	Top-sail.	Top-gallant.	Cross-jack.	Top-sail.
60	26.0	15.75	13.8	40.8	28.56	18.85	22.85	15.99
61	26.5	16.7	14.03	41.48	29.03	19.16	23.23	16.26
62	27.0	17.75	14.26	42.16	29.51	19.47	23.61	16.53
63	27.5	18.7	14.49	42.84	29.99	19.79	23.99	16.79
64	28.0	19.75	14.72	43.52	30.46	20.11	24.37	17.06
65	28.5	20.7	14.95	44.2	30.94	20.42	24.75	17.33
66	29.0	21.75	15.18	44.88	31.42	20.73	25.13	17.59
67	29.5	22.7	15.41	45.56	31.89	21.05	25.51	17.86
68	30.0	23.65	15.64	46.24	32.37	21.36	25.89	18.13
69	30.5	24.6	15.87	46.92	32.84	21.68	26.27	18.39
70	31.0	25.65	16.1	47.60	33.32	21.99	26.66	18.66
71	31.5	26.6	16.33	48.28	33.8	22.30	27.04	18.92
72	32.0	27.55	16.56	48.96	34.27	22.62	27.42	19.19
73	32.5	28.5	16.79	49.64	34.75	22.93	27.8	19.46
74	33.0	28.97	17.02	50.32	35.22	23.24	28.18	19.72
75	33.5	29.45	17.25	51.0	35.7	23.56	28.56	19.99
76	34.0	29.92	17.48	51.68	36.18	23.88	28.94	20.26
77	34.5	30.4	17.71	52.36	36.65	24.19	29.32	20.52
78	35.0	30.87	17.94	53.04	37.13	24.5	29.7	20.79
79	35.5	31.35	18.17	53.72	37.6	24.82	30.08	21.06
80	36.0	31.82	18.4	54.4	38.08	25.13	30.46	21.32
81	36.5	32.3	18.63	55.08	38.56	25.45	30.84	21.59
82	37.0	32.77	18.86	55.76	39.03	25.76	31.22	21.86
83	37.5	33.25	19.09	56.44	39.51	26.07	31.61	22.12
84	38.0	33.72	19.32	57.12	39.98	26.39	31.99	22.39
85	38.5	34.2	19.55	57.8	40.46	26.7	32.37	22.66
86	39.0	34.67	19.78	58.48	40.94	27.01	32.75	22.93
87	39.5	35.15	20.01	59.16	41.41	27.33	33.13	23.19
88	40.0	35.62	20.24	59.84	41.89	27.65	33.51	23.46
89	40.5	36.1	20.47	60.52	42.36	27.96	33.89	23.72
90	41.0	36.57	20.7	61.2	42.84	28.27	34.27	23.99
91	41.5	37.05	20.93	61.88	43.32	28.59	34.65	24.26
92	42.0	37.52	21.16	62.56	43.79	28.9	35.03	24.52
93	42.5	38.0	21.39	63.24	44.27	29.22	35.41	24.79
94	43.0	38.47	21.62	63.92	44.74	29.53	35.79	25.06
95	43.5	38.95	21.85	64.6	45.22	29.84	36.17	25.32
96	44.0	39.42	22.08	65.28	45.70	30.16	36.56	25.59
97	44.5	39.9	22.31	65.96	46.17	30.47	36.94	25.86
98	45.0	40.37	22.54	66.64	46.65	30.79	37.32	26.12
99	45.5	40.85	22.77	67.32	47.12	31.1	37.7	26.39
100	46.0	41.32	23.0	68.0	47.6	31.42	38.08	26.66
101	46.5	41.8	23.23	68.68	48.08	31.73	38.46	26.92
102	47.0	42.27	23.46	69.36	48.55	32.04	38.84	27.19
103	47.5	42.75	23.69	70.0	49.03	32.36	39.22	27.45
104	48.0	43.22	23.92	70.7	49.50	32.67	39.6	27.72
105	48.5	43.7	24.15	71.4	49.98	32.99	39.98	27.99
106	49.0	44.17	24.38	72.08	50.46	33.3	40.36	28.25
107	49.5	44.65	24.61	72.76	50.93	33.61	40.74	28.52
108	50.0	45.12	24.84	73.44	51.41	33.93	41.13	28.79
109	50.5	45.6	25.07	74.12	51.88	34.24	41.51	29.05
110	51.0	46.07	25.3	74.8	52.36	34.56	41.89	29.32

Lengths of Booms, Gaffs, and Yards.

Dimensions of Vessel	BERMUDA SCHOONERS.																						COMMON SCHOONERS.										
	FIRST EXAMPLE.										SECOND EXAMPLE.																					
Length.	Main-boom.	Gaff.		Square-sail-yard.		Top-sail-yard.		Royal-yard.		Square-sail-boom.	Main-boom.	Gaff.		Square-sail-yard.		Top-sail-yard.		Royal-yard.		Square-sail-boom.	Main-boom.	Gaff.		Square-sail-yard.		Top-sail yard.		Royal-yard.		Square-sail-boom.
		Main.	Fore.	Main.	Fore.	Main	Fore.	Main.	Fore.			Main.	Fore.	Main.	Fore.	Main.	Fore	Main.	Fore.			Main.	Fore.	Main.	Fore.	Main.	Fore.	Main.	Fore.	
feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
50	33.0	14.5	14.5	22.0	24.2	16.5	18.1	10.6	11.7	18.5	34.0	16.4	16.4	23.3	28.2	15.0	16.5	10.8	11.9	22.0	35.0	18.5	13.5	26.0	28.6	20.0	20.4	13.0	13.1	20.0
51	33.7	14.8	14.8	22.4	24.7	16.8	18.5	10.8	11.9	18.9	34.7	16.7	16.7	24.0	28.8	15.3	16.9	11.0	12.1	22.4	35.7	18.9	13.8	26.5	29.2	20.4	20.8	13.3	13.4	20.4
52	34.3	15.1	15.1	22.9	25.2	17.2	18.9	11.0	12.1	19.2	35.4	17.0	17.0	24.4	29.3	15.6	17.2	11.2	12.4	22.9	36.4	19.3	14.1	27.0	29.7	20.8	21.1	13.5	13.6	20.8
53	35.0	15.4	15.4	23.3	25.6	17.5	19.2	11.2	12.3	19.6	36.0	17.3	17.3	24.9	29.9	15.9	17.5	11.4	12.6	23.3	37.1	19.7	14.3	27.6	30.3	21.2	21.6	13.8	13.9	21.2
54	35.6	15.7	15.7	23.8	26.1	17.8	19.6	11.4	12.5	20.0	36.7	17.7	17.7	25.4	30.4	16.2	17.9	11.7	12.8	23.8	37.8	20.0	14.6	28.1	30.9	21.6	22.0	14.0	14.2	21.6
55	36.3	16.0	16.0	24.2	26.6	18.2	20.0	11.6	12.7	20.3	37.4	18.0	18.0	25.8	31.0	16.5	18.2	11.9	13.1	24.2	38.5	20.4	14.9	28.6	31.5	22.0	22.5	14.3	14.4	22.0
56	37.0	16.3	16.3	24.6	27.1	18.5	20.3	11.8	13.0	20.7	38.1	18.3	18.3	26.3	31.6	16.8	18.5	12.1	13.3	24.6	39.2	20.8	15.2	29.1	32.0	22.4	22.9	14.6	14.7	22.4
57	37.6	16.5	16.5	25.1	27.6	18.8	20.7	12.0	13.2	21.1	38.8	18.7	18.7	26.8	32.1	17.1	18.9	12.3	13.5	25.1	39.9	21.1	15.4	29.6	32.6	22.8	23.3	14.8	15.0	22.8
58	38.3	16.8	16.8	25.5	28.1	19.1	21.0	12.2	13.4	21.5	39.4	19.0	19.0	27.3	32.7	17.4	19.2	12.5	13.8	25.5	40.6	21.5	15.7	30.2	33.2	23.2	23.7	15.1	15.2	23.2
59	38.9	17.1	17.1	26.0	28.5	19.5	21.4	12.5	13.7	21.8	40.1	19.3	19.3	27.7	33.3	17.7	19.5	12.7	14.0	26.0	41.3	21.9	16.0	30.7	33.7	23.6	24.1	15.3	15.5	23.6
60	39.6	17.4	17.4	26.4	29.0	19.8	21.8	12.7	14.0	22.2	40.8	19.6	19.6	28.2	33.8	18.0	19.8	13.0	14.3	26.4	42.0	22.3	16.2	31.2	34.3	24.0	24.5	15.6	15.7	24.0
61	40.3	17.7	17.7	26.8	29.5	20.1	22.1	12.9	14.2	22.6	41.5	20.0	20.0	28.7	34.4	18.3	20.2	13.2	14.5	26.8	42.7	22.6	16.5	31.7	34.9	24.4	24.9	15.9	16.0	24.4
62	40.9	18.0	18.0	27.3	30.0	20.5	22.5	13.1	14.4	22.9	42.2	20.3	20.3	29.1	35.0	18.6	20.5	13.4	14.7	27.3	43.4	23.0	16.8	32.2	35.5	24.8	25.3	16.1	16.3	24.8
63	41.6	18.3	18.3	27.7	30.5	20.8	22.9	13.3	14.6	23.3	42.8	20.6	20.6	29.6	35.5	18.9	20.8	13.6	15.0	27.7	44.1	23.4	17.1	32.8	36.0	25.2	25.7	16.4	16.5	25.2
64	42.2	18.6	18.6	28.2	31.0	21.1	23.2	13.5	14.8	23.7	43.5	20.9	20.9	30.1	36.1	19.2	21.2	13.8	15.2	28.2	44.8	23.7	17.3	33.3	36.6	25.6	26.1	16.6	16.8	25.6
65	42.9	18.9	18.9	28.6	31.5	21.4	23.6	13.7	15.1	24.0	44.2	21.3	21.3	30.5	36.7	19.5	21.5	14.0	15.4	28.6	45.5	24.1	17.6	33.8	37.2	26.0	26.5	16.9	17.1	26.0
66	43.6	19.2	19.2	29.0	31.9	21.8	23.9	13.9	15.3	24.4	44.9	21.6	21.6	31.0	37.2	19.8	21.8	14.3	15.7	29.0	46.2	24.5	17.9	34.3	37.8	26.4	26.9	17.2	17.3	26.4
67	44.2	19.4	19.4	29.5	32.4	22.1	24.3	14.1	15.5	24.8	45.6	21.9	21.9	31.5	37.8	20.1	22.2	14.5	15.9	29.5	46.9	24.8	18.1	34.8	38.3	26.8	27.4	17.4	17.6	26.8
68	44.9	19.7	19.7	29.9	32.9	22.4	24.6	14.3	15.7	25.2	46.2	22.3	22.3	32.0	38.3	20.4	22.5	14.7	16.2	29.9	47.6	25.2	18.4	35.4	38.9	27.2	27.8	17.7	17.8	27.2
69	45.5	20.0	20.0	30.4	33.4	22.8	25.0	14.6	16.0	25.5	46.9	22.6	22.6	32.4	38.9	20.7	22.8	14.9	16.4	30.4	48.3	25.6	18.7	35.9	39.5	27.6	28.2	17.9	18.1	27.6
70	46.2	20.3	20.3	30.8	33.9	23.1	25.4	14.8	16.3	25.9	47.6	22.9	22.9	32.9	39.5	21.0	23.2	15.1	16.6	30.8	49.0	26.0	18.9	36.4	40.0	28.0	28.6	18.2	18.4	28.0
71	46.9	20.6	20.6	31.2	34.4	23.4	25.7	15.0	16.5	26.3	48.3	23.2	23.2	33.4	40.0	21.3	23.5	15.3	16.9	31.2	49.7	26.3	19.2	36.9	40.6	28.4	29.0	18.5	18.6	28.4
72	47.5	20.9	20.9	31.7	34.8	23.8	26.1	15.2	16.7	26.5	48.9	23.6	23.6	33.8	40.6	21.6	23.8	15.6	17.1	31.7	50.4	26.7	19.5	37.4	41.2	28.8	29.4	18.7	18.9	28.8
73	48.2	21.2	21.2	32.1	35.3	24.1	26.5	15.4	16.9	26.9	49.7	23.9	23.9	34.3	41.2	21.9	24.2	15.8	17.4	32.1	51.1	27.1	19.8	38.0	41.8	29.2	29.8	19.0	19.2	29.2
74	48.8	21.5	21.5	32.6	35.8	24.4	26.8	15.6	17.2	27.3	50.3	24.2	24.2	34.8	41.7	22.2	24.5	16.0	17.6	32.6	51.8	27.4	20.0	38.5	42.3	29.6	30.2	19.2	19.4	29.6

Lengths of Booms, Gaffs, and Yards (Continued).

Dimensions of Vessel.	BERMUDA SCHOONERS.																				COMMON SCHOONERS.									
	FIRST EXAMPLE.										SECOND EXAMPLE.																			
Length.	Main-boom.	Gaff.		Square-sail-yard		Top-sail-yard.		Royal-yard.		Square-sail-boom.	Main-boom.	Gaff.		Square-sail-yard.		Top-sail-yard.		Royal-yard.		Square-sail-boom.	Main-boom.	Gaff.		Square-sail-yard		Top-sail-yard.		Royal-yard.		Square-sail-boom.
		Main.	Fore.	Main.	Fore.	Main.	Fore.	Main.	Fore.			Main.	Fore.	Main.	Fore.	Main.	Fore.	Main.	Fore.			Main.	Fore.	Main.	Fore.	Main.	Fore.	Main.	Fore.	
feet.	feet.	feet.	feet	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
75	49.5	21.8	21.8	33.0	36.3	24.8	27.2	15.8	17.4	27.6	51.0	24.5	24.5	35.2	42.3	22.6	24.8	16.2	17.8	33.0	52.5	27.8	20.3	39.0	42.9	30.0	30.6	19.5	19.7	30.0
76	50.2	22.1	22.1	33.4	36.8	25.1	27.6	16.0	17.6	28.0	51.7	24.9	24.9	35.7	42.9	22.9	25.1	16.4	18.1	33.4	53.2	28.3	20.6	39.5	43.5	30.4	31.0	19.8	19.9	30.4
77	50.8	22.4	22.4	33.9	37.3	25.4	27.9	16.2	17.8	28.4	52.4	25.2	25.2	36.2	43.4	23.2	25.5	16.6	18.3	33.9	53.9	28.6	20.8	40.0	44.0	30.8	31.4	20.0	20.2	30.8
78	51.5	22.6	22.6	34.3	37.8	25.7	28.3	16.5	18.0	28.8	53.0	25.5	25.5	36.7	44.0	23.5	25.8	16.9	18.5	34.3	54.6	28.9	21.1	40.6	44.6	31.2	31.8	20.3	20.5	31.2
79	52.1	22.9	22.9	34.8	38.2	26.1	28.6	16.7	18.4	29.1	53.7	25.9	25.9	37.1	44.5	23.8	26.1	17.1	18.8	34.8	55.3	29.3	21.4	41.1	45.2	31.6	32.3	20.5	20.7	31.6
80	52.8	23.2	23.2	35.2	38.7	26.4	29.0	16.9	18.6	29.5	54.4	26.2	26.2	37.6	45.1	24.1	26.5	17.3	19.0	35.2	56.0	29.7	21.7	41.6	45.8	32.0	32.7	20.8	21.0	32.0
81	53.5	23.5	23.5	35.6	39.2	26.7	29.4	17.1	18.8	29.9	55.1	26.5	26.5	38.1	45.7	24.4	26.8	17.5	19.3	35.6	56.7	30.0	21.9	42.1	46.3	32.4	33.1	21.1	21.3	32.4
82	54.1	23.8	23.8	36.1	39.7	27.0	29.7	17.3	19.0	30.2	55.7	26.8	26.8	38.5	46.2	24.7	27.1	17.7	19.5	36.1	57.4	30.4	22.0	42.6	46.9	32.8	33.5	21.3	21.5	32.8
83	54.8	24.1	24.1	36.5	40.2	27.4	30.1	17.5	19.2	30.6	56.5	27.2	27.2	39.0	46.8	25.0	27.5	17.9	19.7	36.5	58.1	30.8	22.5	43.2	47.5	33.2	33.9	21.6	21.8	33.2
84	55.4	24.4	24.4	37.0	40.6	27.7	30.5	17.7	19.5	31.0	57.1	27.5	27.5	39.4	47.4	25.3	27.8	18.2	20.0	37.0	58.8	31.2	22.7	43.7	48.0	33.6	34.3	21.8	22.0	33.6
85	56.1	24.7	24.7	37.4	41.1	28.0	30.8	17.9	19.7	31.3	57.8	27.8	27.8	39.9	47.9	25.6	28.1	18.4	20.2	37.4	59.5	31.5	23.0	44.2	48.6	34.0	34.7	22.1	22.3	34.0
86	56.8	25.0	25.0	37.8	41.6	28.4	31.0	18.1	19.9	31.7	58.5	28.1	28.1	40.4	48.5	25.9	28.5	18.6	20.4	37.8	60.2	31.9	23.3	44.7	49.2	34.4	35.1	22.4	22.6	34.4
87	57.4	25.3	25.3	38.3	42.1	28.7	31.6	18.4	20.2	32.1	59.2	28.5	28.5	40.9	49.1	26.2	28.8	18.8	20.7	38.3	60.9	32.3	23.6	45.2	49.8	34.8	35.5	22.6	22.8	34.8
88	58.1	25.5	25.5	38.7	42.6	29.0	31.9	18.6	20.5	32.5	59.9	28.8	28.8	41.4	49.6	26.5	29.1	19.0	20.9	38.7	61.6	32.6	23.8	45.8	50.3	35.2	35.9	22.9	23.1	35.2
89	58.7	25.8	25.8	39.2	43.1	29.4	32.3	18.8	20.7	32.8	60.5	29.1	29.1	41.8	50.2	26.8	29.4	19.2	21.2	39.2	62.3	33.0	24.1	46.3	50.9	35.6	36.3	23.1	23.4	35.6
90	59.4	26.1	26.1	39.6	43.6	29.7	32.6	19.0	21.0	33.2	61.2	29.5	29.5	42.3	50.8	27.1	29.8	19.4	21.4	39.6	63.0	33.4	24.4	46.8	51.5	36.0	36.7	23.4	23.6	36.0
91	60.1	26.4	26.4	40.0	44.0	30.0	33.0	19.2	21.1	33.6	61.9	29.8	29.8	42.8	51.3	27.4	30.1	19.7	21.6	40.0	63.7	33.8	24.6	47.3	52.0	36.4	37.2	23.7	23.9	36.4
92	60.7	26.7	26.7	40.5	44.5	30.4	33.4	19.4	21.3	33.9	62.6	30.1	30.1	43.2	51.9	27.7	30.4	19.9	21.9	40.5	64.4	34.1	24.9	47.8	52.6	36.8	37.6	23.9	24.1	36.8
93	61.4	27.0	27.0	40.9	45.0	30.7	33.7	19.6	21.6	35.3	63.2	30.4	30.4	43.7	52.4	28.0	30.8	20.1	22.1	40.9	65.1	34.5	25.2	48.4	53.2	37.2	38.0	24.2	24.4	37.2
94	62.0	27.3	27.3	41.4	45.5	31.0	34.1	19.8	21.8	35.7	63.9	30.8	30.8	44.2	53.0	28.3	31.1	20.3	22.3	41.4	65.8	34.9	25.4	48.9	53.8	37.6	38.4	24.4	24.7	37.6
95	62.7	27.6	27.6	41.8	46.0	31.3	34.5	20.0	22.0	36.0	64.6	31.1	31.1	44.6	53.6	28.6	31.4	20.5	22.6	41.8	66.5	35.2	25.7	49.4	54.3	38.0	38.8	24.7	24.9	38.0
96	63.4	27.9	27.9	42.2	46.5	31.7	34.8	20.3	22.3	36.4	65.3	31.4	31.4	45.1	54.1	28.9	31.8	20.7	22.8	42.2	67.2	35.6	26.0	49.9	54.9	38.4	39.2	25.0	25.2	38.4
97	64.0	28.2	28.2	42.7	46.9	32.0	35.2	20.5	22.5	36.8	65.9	31.8	31.8	45.6	54.7	29.2	32.1	21.0	23.1	42.7	67.9	36.0	26.3	50.4	55.4	38.8	39.6	25.2	25.4	38.8
98	64.7	28.4	28.4	43.1	47.4	32.3	35.5	20.7	22.8	37.2	66.6	32.1	32.1	46.1	55.3	29.5	32.4	21.2	23.3	43.1	68.6	36.3	26.5	51.0	56.1	39.2	40.0	25.5	25.7	39.2

Rigged as Brig Forward and Schooner Aft.

FIRST EXAMPLE.

Length of Vessel.	Main Boom.	GAFFS.		FORE-YARDS.				MAIN-YARDS.			Swing Boom.
		Main.	Fore.	Lower.	Top-sail.	Top-gallant.	Royal.	Square-sail.	Top-sail.	Top-gallant.	
feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
60	35.16	20.25	20.25	34.5	25.39	14.57	11.65	26.4	19.8	12.67	23.46
61	35.74	20.58	20.58	35.07	25.81	14.81	11.84	26.84	20.13	12.88	23.85
62	36.33	20.92	20.92	35.65	26.23	15.05	12.04	27.28	20.46	13.09	24.24
63	36.91	21.26	21.26	36.22	26.66	15.29	12.23	27.72	20.79	13.3	24.63
64	37.5	21.59	21.59	36.8	27.08	15.54	12.42	28.16	21.12	13.51	25.02
65	38.09	21.93	21.93	37.37	27.5	15.78	12.62	28.60	21.45	13.72	25.41
66	38.67	22.27	22.27	37.95	27.93	16.02	12.81	29.04	21.78	13.93	25.8
67	39.26	22.6	22.6	38.52	28.35	16.26	13.0	29.48	22.11	14.14	26.19
68	39.84	22.94	22.94	39.1	28.77	16.5	13.2	29.92	22.44	14.36	26.58
69	40.43	23.28	23.28	39.67	29.19	16.75	13.39	30.36	22.77	14.57	26.97
70	41.02	23.62	23.62	40.25	29.62	16.99	13.58	30.80	23.1	14.78	27.37
71	41.6	23.95	23.95	40.82	30.04	17.23	13.77	31.24	23.43	14.99	27.76
72	42.19	24.29	24.29	41.4	30.46	17.47	13.97	31.68	23.76	15.2	28.15
73	42.77	24.63	24.63	41.97	30.89	17.71	14.16	32.12	24.09	15.41	28.54
74	43.36	24.96	24.96	42.55	31.31	17.96	14.35	32.56	24.42	15.62	28.93
75	43.95	25.3	25.3	43.12	31.73	18.2	14.55	33.0	24.75	15.83	29.32
76	44.53	25.64	25.64	43.7	32.16	18.44	14.74	33.44	25.08	16.04	29.71
77	4[illegible].12	25.97	25.97	44.27	32.58	18.68	14.93	33.88	25.41	16.25	30.1
78	45.7	26.31	26.31	44.85	33.0	18.92	15.13	34.32	25.74	16.47	30.49
79	46.29	26.65	26.65	45.42	33.42	19.17	15.32	34.76	26.07	16.68	30.88
80	46.88	26.99	26.99	46.0	33.85	19.41	15.51	35.2	26.4	16.89	31.28
81	47.46	27.32	27.32	46.57	34.27	19.65	15.7	35.64	26.73	17.1	31.67
82	48.05	27.66	27.66	47.15	34.69	19.89	15.9	36.08	27.06	17.31	32.06
83	48.63	28.0	28.0	47.72	35.12	20.13	16.09	36.52	27.39	17.52	32.45
84	49.22	28.33	28.33	48.3	35.54	20.38	16.28	36.96	27.72	17.73	32.84
85	49.81	28.67	28.67	48.87	35.96	20.62	16.48	37.4	28.05	17.94	33.23
86	50.39	29.01	29.01	49.45	36.39	20.86	16.67	37.84	28.38	18.15	33.62
87	50.98	29.34	29.34	50.02	36.81	21.1	16.86	38.28	28.71	18.36	34.01
88	51.56	29.68	29.68	50.6	37.23	21.34	17.06	38.72	29.04	18.58	34.4
89	52.15	30.02	30.02	51.17	37.65	21.59	17.25	39.16	29.37	18.79	34.79
90	52.74	30.36	30.36	51.75	38.08	21.83	17.44	39.6	29.7	19.0	35.19
91	53.32	30.69	30.69	52.32	38.5	22.07	17.63	40.04	30.03	19.21	35.58
92	53.91	31.03	31.03	52.9	38.92	22.31	17.83	40.48	30.36	19.42	35.97
93	54.49	31.37	31.37	53.47	39.35	22.55	18.02	40.92	30.69	19.63	36.36
94	55.08	31.7	31.7	54.05	39.77	22.8	18.21	41.36	31.02	19.84	36.75
95	55.67	32.04	32.04	54.62	40.19	23.04	18.41	41.8	31.35	20.05	37.14
96	56.25	32.38	32.38	55.2	40.62	23.28	18.6	42.24	31.68	20.26	37.53
97	56.84	32.71	32.71	55.77	41.04	23.52	18.79	42.68	32.01	20.47	37.92
98	57.42	33.05	33.05	56.35	41.46	23.76	18.9	43.12	32.34	20.69	38.31
99	58.01	33.39	33.39	57.92	41.88	24.01	19.18	43.56	32.67	20.9	38.7
100	58.6	33.73	33.73	57.5	42.31	24.25	19.37	44.0	33.0	21.11	39.1
101	59.18	34.06	34.06	58.07	42.73	24.47	19.56	44.44	33.33	21.32	39.49
102	59.77	34.4	34.4	58.65	43.15	24.73	19.76	44.88	33.66	21.53	39.88
103	60.35	34.74	34.74	59.22	43.58	24.97	19.95	45.32	33.99	21.74	40.27
104	60.94	35.07	35.07	59.8	44.0	25.22	20.14	45.76	34.30	21.95	40.66
105	61.53	35.41	35.41	60.37	44.42	25.46	20.34	46.2	34.65	22.16	41.05
106	62.11	35.75	35.75	60.95	44.85	25.7	20.53	46.64	34.98	22.37	41.44
107	62.7	36.08	36.08	61.52	45.25	25.94	20.72	47.08	35.31	22.58	41.83
108	63.28	36.42	36.42	62.1	45.67	26.18	20.92	47.52	35.64	22.8	42.22
109	63.87	36.76	36.76	62.67	46.09	26.43	21.11	47.96	35.97	23.01	42.61
110	64.46	37.1	37.1	63.25	46.52	26.67	21.3	48.4	36.3	23.22	43.01

Rigged as Brig Forward and Schooner Aft.

SECOND EXAMPLE.

Length of Vessel.	Main Boom.	GAFFS.		FORE-YARDS.				MAIN-YARDS.			Swing Boom.
		Main.	Fore.	Lower.	Top-sail.	Top-gallant.	Royal.	Square-sail.	Top-sail.	Top-gallant.	
44	36.0	21.24	21.24	30.0	22.92	15.12	10.58	28.2	18.05	12.97	20.4
45	36.6	21.59	21.59	30.5	23.3	15.37	10.76	28.67	18.35	13.18	20.74
46	37.2	21.94	21.94	31.0	23.68	15.63	10.93	29.14	18.65	13.4	21.08
47	37.8	22.3	22.3	31.5	24.06	15.88	11.11	29.61	18.95	13.62	21.42
48	38.4	22.65	22.65	32.0	24.44	16.13	11.28	30.08	19.25	13.83	21.76
49	39.0	23.01	23.01	32.5	24.83	16.38	11.46	30.55	19.55	14.05	22.1
50	39.6	23.36	23.36	33.0	25.21	16.63	11.64	31.02	19.85	14.26	22.44
51	40.2	23.71	23.71	33.5	25.59	16.89	11.81	31.49	20.15	14.48	22.76
52	40.8	24.04	24.04	34.0	25.97	17.14	11.99	31.96	20.45	14.7	23.12
53	41.4	24.42	24.42	34.5	26.35	17.39	12.16	32.43	20.75	14.91	23.46
54	42.0	24.78	24.78	35.0	26.74	17.64	12.34	32.9	21.05	15.13	23.8
55	42.6	25.13	25.13	35.5	27.12	17.89	12.52	33.37	21.35	15.34	24.14
56	43.2	25.48	25.48	36.0	27.5	18.15	12.69	33.84	21.65	15.56	24.48
57	43.8	25.84	25.84	36.5	27.88	18.4	12.87	34.31	21.95	15.78	24.82
58	44.4	26.19	26.19	37.0	28.26	18.65	13.04	34.78	22.25	15.99	25.16
59	45.0	26.55	26.55	37.5	28.65	18.9	13.22	35.25	22.55	16.21	25.5
60	45.6	26.9	26.9	38.0	29.03	19.15	13.4	35.72	22.85	16.42	25.84
61	46.2	27.25	27.25	38.5	29.41	19.41	13.57	36.19	23.15	16.64	26.18
62	46.8	27.61	27.61	39.0	29.79	19.66	13.75	36.66	23.45	16.36	26.52
63	47.4	27.96	27.96	39.5	30.17	19.91	13.92	37.13	23.75	17.07	26.86
64	48.0	28.32	28.32	40.0	30.56	20.16	14.1	37.6	24.05	17.29	27.2
65	48.6	28.67	28.67	40.5	30.94	20.41	14.28	38.07	24.35	17.5	27.54
66	49.2	29.02	29.02	41.0	31.32	20.67	14.45	38.54	24.65	17.72	27.88
67	49.8	29.38	29.38	41.5	31.7	20.92	14.63	39.01	24.95	17.94	28.22
68	50.4	29.73	29.73	42.0	32.08	21.17	14.8	39.48	25.25	18.15	28.56
69	51.0	30.09	30.09	42.5	32.47	21.42	14.98	39.95	25.55	18.37	28.9
70	51.6	30.44	30.44	43.0	32.85	21.67	15.16	40.42	25.85	18.58	29.24
71	52.2	30.79	30.79	43.5	33.23	21.93	15.33	40.89	26.15	18.8	29.58
72	52.8	31.15	31.15	44.0	33.61	22.18	15.51	41.36	26.45	19.02	29.92
73	53.4	31.5	31.5	44.5	33.99	22.43	15.68	41.83	26.75	19.23	30.26
74	54.0	31.86	31.86	45.0	34.38	22.68	15.86	42.3	27.05	19.45	30.6
75	54.6	32.21	32.21	45.5	34.76	22.93	16.04	42.77	27.35	19.66	30.94
76	55.2	32.56	32.56	46.0	35.14	23.19	16.21	43.24	27.65	19.88	31.28
77	55.8	32.92	32.92	46.5	35.52	23.44	16.39	43.71	27.95	20.1	31.62
78	56.4	33.27	33.27	47.0	35.9	23.69	16.56	44.18	28.25	20.31	31.96
79	57.0	33.63	33.63	47.5	36.29	23.94	16.74	44.65	28.55	20.53	32.3
80	57.6	33.98	33.98	48.0	36.67	24.19	16.92	45.12	28.85	20.74	32.64
81	58.2	34.33	34.33	48.5	37.05	24.45	17.09	45.59	29.15	20.96	32.98
82	58.8	34.69	34.69	49.0	37.43	24.7	17.27	46.06	29.45	21.18	33.32
83	59.4	35.04	35.04	49.5	37.81	24.95	17.4	46.53	29.75	21.39	33.66
84	60.0	35.4	35.4	50.0	38.2	25.2	17.62	47.0	30.05	21.61	34.0
85	60.6	35.75	35.75	50.5	38.58	25.45	17.8	47.47	30.35	21.82	34.34
86	61.2	36.1	36.1	51.0	38.96	25.71	17.97	47.94	30.65	22.04	34.68
87	61.8	36.46	36.46	51.5	39.34	25.96	18.15	48.41	30.95	22.26	35.02
88	62.4	36.81	36.81	52.0	39.72	26.21	18.32	48.88	31.25	22.47	35.36
89	63.0	37.17	37.17	52.5	40.11	26.46	18.5	49.35	31.55	22.69	35.7
90	63.6	37.52	37.52	53.0	40.49	26.71	18.68	49.82	31.85	22.9	36.04
91	64.2	37.87	37.87	53.5	40.87	26.97	18.85	50.29	32.15	23.12	36.38
92	64.8	38.23	38.23	54.0	41.25	27.22	19.03	50.76	32.45	23.34	36.72
93	65.4	38.58	38.58	54.5	41.63	27.44	19.2	51.23	32.75	23.55	37.06
94	66.0	38.94	38.94	55.0	42.02	27.72	19.39	51.7	33.05	23.77	37.4
95	66.6	39.30	39.28	55.5	42.41	28.1	19.56	52.2	33.3	24.0	37.8

From the great difference we find in the masting of yachts as cutters, in relation to the length and breadth, a difficulty arises in deciding on the best proportions in terms of these simple elements. In Example 1, we have the masting when carried to the extreme, and applied to those yachts only that must have been extremely stiff, to have stood properly under their canvas. Example 2 will be found to come the nearest to the common masting, and to those vessels that have been considered to have the best-proportioned sails, and of which the following are examples:

Table:—Giving the Dimensions and the Proportions of Masting of several Yachts rigged as Cutters

OWNERS.	NAMES.	Tonnage.	Length on deck.	Breadth extreme.	Proportions of masts to breadth.	Lower-mt.		Top-masts.		Bowsprit.	Boom.	Gaff.	Spread-yard.
						Hounded length.	Headed.	Hounded.	Pole.				
			feet.	feet.	prop.	feet.	feet.	feet.	feet.	feet.	feet.	feet.	feet.
T. A. Smith, Esq.	Menia ...	176	77.8	23.2 ×	2.87 =	66.6	14.	45.	9.	59.4	59.	41.	59.
J. Maxse, Esq.	Miranda	147	71.8	22. ×	2.86 =	63.	13.	41.5	10.25	56.	56.	42.	53.
Earl of Belfast	Louisa ..	140	69.75	21.75 ×	2.87 =	62.5	13.5	41.	12.	56.	66.	41.	56.
Marquis of Anglesey..	Pearl....	113	64.9	19.54 ×	2.86 =	57.	12.	38.25	6.75	50.75	59.25	38.25	—
Earl De Grey	Nautilus	103	63.1	19.2 ×	3.46 =	66.5	11.75	39.	8.	59.5	62.	43.	—
Earl of Ilchester......	Petrel ..	85	57.1	19.1 ×	2.9 =	55.5	12.	37.5	8.	48.75	53.	34.	48.
Tender	Emerald	86	57.25	18.8 ×	2.84 =	53.4	12.3	36.75	6.3	44.75	55.3	35.75	45.
Charles Pratt, Esq....	Psyche ..	26	36.	13. ×	3.15 =	41.	8.	26.	4.	28.	36.5	24.5	33.
Captain Corry.... ...	Phœbe ..	37	42.75	14.16 ×	2.82 =	39.9	8.	30.	3.	28.	39.	25.	34.

Examples of Ketches and Schooners.

In the mode of rigging as a ketch, we find the moment of sail considerably greater than that commonly given to vessels of any other rig. In a ketch that was taken as an example, the moment of sail, when compared with a brig, was found to be nearly one quarter more, which appears to be occasioned by those vessels having the body of sail on one taunt-mast, as may be seen by the following example. In another example that was taken when the breadth was 23 and the length 75 feet, the length of the main-mast hounded was 62 feet, and the lower-yard 52 feet, which gave a mast 9 feet, and a yard 11 feet, longer than is commonly given to ships of the same dimensions.

Area and Moment of Sail of a Ketch.

	Area.	Height.	Moment.	Area.	Distance.	Moment before.	Moment abaft.
Jib	594 ×	32 =	19008—	594 ×	57 =	33858	..
Stay fore-sail	495 ×	24 =	11880—	495 ×	40 =	19800	..
Course	1605 ×	25 =	40125—	1605 ×	7 =	11235	..
Top-sail.................	1133 ×	55 =	62315—	1133 ×	5 =	5665	..
Top-gallant-sail	464 ×	79 =	36656—	464 ×	3 =	1392	..
Fore and aft fore-sail	1138 ×	28 =	31864—	1138 ×	11 =	——	12518
Mizen top-sail	406 ×	46 =	18676—	406 ×	20 =	——	8120
Driver	741 ×	23 =	17043—	741 ×	40 =	——	29640
Total	6576		237567	6576		71950	50278

Height of centre of effort above the water-line.. $\left.\right\} \frac{237567}{6576}=36.12$

Centre of effort before the mid. of wa.-line $\left.\right\} \frac{71950-50278}{6576}=3.29$

The dimensions given in the tables for the common schooner are those most approved of; but in some vessels of this rig, they are found to exceed those in the table, from $\frac{1}{18}$ to $\frac{1}{20}$. In schooners of the American or Bermudean rig, we find great difference in the proportions of their several spars, in terms of their length and breadth, especially in their fore-masts, which are frequently nearly equal to the main, with considerably more rake. The following example is one that was taken in forming the proportions given :

Area and Moment of Sail of a Schooner.

	Area.	Height.	Moment.	Area.	Distance.	Moment before.	Moment abaft.
Jib	874 ×	29 =	25346—	874 ×	56 =	48744	..
Fore stay-sail	432 ×	22 =	9504—	432 ×	32 =	13824	..
Square fore-top-sail	865 ×	62 =	53630—	865 ×	15 =	12975	..
Fore-sail	1391 ×	30 =	41730—	1391 ×	4½ =	6259	..
Main-sail	2177 ×	31 =	67487—	2177 ×	37 =	=	80549
Total	5739		197697			81802	80549

Height of centre of effort above the water-line.. $\left.\right\} \frac{197697}{5739}=34.4$

Centre of effort before the mid. of wat.-line $\left.\right\} \frac{81802-80549}{5739}=2.01$

On Masting of Brigs.

Brigs, as vessels of war, appear to have taken the place of cutters, when the latter were extended to such dimensions as rendered them unsafe and inconvenient, and when their spars were beyond the size to which the necessary support could be given.

To vessels of a certain capacity in the commercial navy, this rig is well adapted, as the whole surface of sail is divided into a greater number of parts, and can be more easily worked by a smaller number of men than the fore-and-aft rig; but it is not desirable in vessels of war, as speed and safety are in them of the highest importance; for which reason, this rig should not be applied to vessels that are too small.

When this rig is applied to vessels of considerable force, it is found to be particularly disadvantageous, especially in time of action; and the great encumbrance of tops, ropes, &c., that must be employed to support the different yards, masts, &c., makes it less suitable for small vessels than a less complicated rig.

Vessels with two or three Bermudean masts, within certain limits, have many advantages over the brig, because greater area of sail can be obtained with less moment (see Tables); and by suppressing the tops, caps, &c., they are not only improved in sailing on a wind, but the moments of the weights aloft being reduced, less ballast will be required, and the vessel's qualities improved.*

The limits to which Bermudean sails may be carried, are best determined by experience, or by taking the size of the main-sails of cutters that can be worked with ease, without the wear and tear being increased beyond the ordinary course, and to which proper support can be given, as a maximum; while Bermudeans are thus confined within the limits that experience points out, they must have great advantage over the more complex rig, where the sails are multiplied beyond what is necessary.

When brigs are altered to ships, if we give them the same position of sail as that commonly given to ships, without considering the form, it is most

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* In a comparison made on the different modes of rigging, it was found, that the comparative areas in relation to the moments were

	Area.		Moment.
For brigs	6538	—	247545
Two-mast schooners	6690	—	247924
Three-mast schooners	6996	—	247694

In the brig, the jib, courses, top-sails, top-gallant-sails, and fore and aft main-sails were taken; in the schooners, jib, fore and aft sails, and square fore-top-sail.

probable the best disposition will not be obtained; since this class of vessels was originally derived from the cutter; and, in most cases, in their construction the same form has continued to be preserved, and consequently requires that the position of their sails should assimilate to it. The projector of the old 18-gun brigs, appears to have followed the same rule in the construction of these vessels, for we find the proportion of their breadth, in relation to their length, is considerably greater than that commonly given to ships; while, from the form of their body, they have a much greater difference of draught of water, with the excess aft; with this form, however, approaching that of the cutter, they have their sails suitably disposed, with the centre of effort much further aft than is common to ships. In ships, as usually constructed and rigged, the centre of effort is never nearer the middle than .038 the length of the water-line; and the after-moment to the fore is seldom more than .77 to 1; whereas, in the 18-gun brigs, it is not more than .026 of the length of the water-line before the middle, with the after moment to the fore as .83 to 1; and with this disposition of sail they were found to carry a proper helm, and work well. To produce the same effects, therefore, when converted into a ship, we must continue the same relative positions of the sails, or a proper equilibrium will not be preserved, nor the necessary qualities of working maintained. To alter the trim to carry a proper helm, from the mean resultant of the water passing so far aft, on account of the fineness of this part of the body, they must be brought nearer to an even keel; by such an alteration, the centre of gravity would pass very far forward; this, from the increased angular inertia, must cause the body to plunge more heavily, while it must lessen the effect of the head-sails in working the ship.

In the brigs, that the sails may produce their proper effect and be in a proper relation to the body, we find the masts are further aft than in ships; the main-mast is, in general, .147 abaft, and the fore-mast .331 before the middle of the water-line; while ships seldom exceed, for the main, .07 the length abaft, and the fore is frequently .34 before the middle of the water-line; and in the alteration from a brig to a ship, the position, as in the brig, must not be much varied from, since the body is formed for a brig, and it will be found that the moment of the sails on the mizen-mast will not exceed that of the fore and aft main-sail, in the brig, more than $\frac{1}{5}$, while the sails, placed as in a ship, would be much less effective.

BRIGS.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprit, Jib, and Flying Jib-boom.

Dimensions.		BRIGS OF WAR.																							
		FIRST EXAMPLE.													SECOND EXAMPLE.										
		Lower-masts.				Top-mast.				Top-gallant-mast.		Bowsprit.	Jib-boom.	Flying jib-boom.	Lower-masts.				Top-mast.		Top-gallant-mast.		Bowsprit.	Jib-boom.	Flying jib-bo. m.
		Main.		Fore.		Main.		Fore.		Main and Fore.					Main.		Fore.		Main and Fore.		Main and Fore.				
Breadth when .32 of the length.	Breadth when .3 of the length.	Hounded.	Headed.	Hound.d	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Pole.				Hounded	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Pole.			
21.5	20.0	38.1	7.5	33.1	6.3	22.6	3.5	21.3	3.4	15.3	11.5	27.2	20.1	21.0	38.2	7.4	32.7	6.1	22.5	3.6	14.4	10.6	29.4	22.0	26.4
22.0	20.5	39.1	7.7	34.0	6.5	23.2	3.6	21.9	3.5	15.7	11.8	27.9	20.6	21.6	39.1	7.6	33.5	6.3	23.1	3.6	14.8	10.9	30.1	22.5	27.1
22.5	21.0	40.1	7.9	34.9	6.7	23.7	3.7	22.4	3.5	16.1	12.0	28.7	21.1	22.2	40.1	7.7	34.3	6.4	23.6	3.7	15.2	11.1	30.9	23.1	27.8
23.0	21.5	41.1	8.1	35.8	6.9	24.3	3.8	22.9	3.6	16.4	12.3	29.4	21.6	22.8	41.1	7.9	35.1	6.6	24.2	3.8	15.5	11.4	31.6	23.6	28.4
23.5	22.0	42.1	8.3	36.7	7.1	24.9	3.9	23.5	3.7	16.8	12.6	30.2	22.1	23.4	42.0	8.1	35.9	6.8	24.8	3.9	15.9	11.6	32.3	24.2	29.1
24.0	22.5	43.1	8.5	37.6	7.3	25.4	4.0	24.0	3.8	17.2	12.9	31.0	22.5	24.0	43.0	8.3	36.7	7.0	25.3	4.0	16.2	11.9	33.1	24.7	29.8
24.5	23.0	44.0	8.7	38.4	7.4	26.0	4.1	24.6	3.9	17.6	13.2	31.7	23.0	24.6	43.9	8.5	37.6	7.1	25.9	4.1	16.6	12.2	33.8	25.3	30.4
25.0	23.5	45.0	8.9	39.3	7.6	26.5	4.2	25.1	4.0	17.9	13.5	32.5	23.5	25.2	44.9	8.7	38.4	7.3	26.5	4.2	17.0	12.4	34.5	25.8	31.1
25.5	24.0	46.0	9.0	40.2	7.8	27.1	4.3	25.6	4.1	18.4	13.8	33.3	24.0	25.8	45.8	8.8	39.2	7.5	27.0	4.3	17.3	12.7	35.3	26.4	31.7
26.0	24.5	47.0	9.2	41.0	7.9	27.7	4.4	26.2	4.1	18.7	14.0	34.0	21.5	26.3	46.8	9.0	40.0	7.7	27.6	4.4	17.7	13.0	36.0	26.9	32.4
26.5	25.0	48.0	9.4	41.9	8.1	28.2	4.5	26.7	4.2	19.1	14.3	34.8	24.9	26.9	47.7	9.2	40.8	7.9	28.1	4.5	18.1	13.2	36.7	27.5	33.1
27.0	25.5	48.9	9.6	42.8	8.3	28.8	4.6	27.2	4.3	19.5	14.6	35.6	25.4	27.5	48.7	9.4	41.6	8.1	28.7	4.5	18.4	13.5	37.4	28.0	33.7
27.5	26.0	49.9	9.8	43.7	8.4	29.4	4.7	27.8	4.4	19.9	14.9	36.4	25.9	28.1	49.7	9.6	42.4	8.3	29.3	4.6	18.8	13.8	38.2	28.6	34.4
28.0	26.5	50.9	10.0	44.5	8.6	29.9	4.7	28.3	4.5	20.3	15.2	37.1	26.4	28.7	50.6	9.8	43.3	8.5	29.8	4.7	19.1	14.0	38.9	29.1	35.0
28.5	27.0	51.9	10.2	45.4	8.8	30.5	4.8	28.8	4.6	20.6	15.5	37.9	26.9	29.3	51.6	10.0	44.1	8.7	30.4	4.8	19.5	14.3	39.7	29.7	35.7
29.0	27.5	52.8	10.4	46.3	8.9	31.2	4.9	29.4	4.6	21.0	15.8	38.7	27.3	29.8	52.5	10.1	44.9	8.9	31.0	4.9	19.9	14.6	40.4	30.2	36.4
29.5	28.0	53.8	10.6	47.1	9.1	31.6	5.0	29.9	4.7	21.4	16.1	39.5	27.8	30.4	53.5	10.3	45.7	9.0	31.5	5.0	20.2	14.8	41.1	30.8	37.0
30.0	28.5	54.8	10.7	48.0	9.3	32.2	5.1	30.4	4.8	21.8	16.3	40.2	28.3	31.0	54.4	10.5	46.5	9.2	32.1	5.1	20.6	15.1	41.9	31.3	37.7
30.5	29.0	55.8	10.9	48.9	9.4	32.8	5.2	31.0	4.9	22.2	16.6	41.0	28.8	31.6	55.4	10.7	47.3	9.4	32.6	5.2	20.9	15.4	42.6	31.9	38.3
31.0	29.5	56.8	11.1	49.8	9.6	33.3	5.3	31.5	5.0	22.6	16.9	41.8	29.5	32.2	56.3	10.9	48.2	9.6	33.2	5.3	21.3	15.6	43.3	32.4	39.0
31.5	30.0	57.7	11.3	50.7	9.8	33.9	5.4	32.0	5.1	22.9	17.2	42.6	29.7	32.8	57.3	11.1	49.0	9.8	33.8	5.3	21.7	15.9	44.1	33.0	39.7
32.0	30.5	58.7	11.5	51.5	10.0	34.5	5.5	32.6	5.1	23.3	17.5	43.3	30.2	33.4	58.2	11.2	49.8	10.0	34.3	5.4	22.0	16.2	44.8	33.5	40.3
32.5	31.0	59.7	11.7	52.4	10.1	35.0	5.6	33.1	5.2	23.6	17.8	44.1	30.7	33.9	59.2	11.4	50.6	10.1	34.9	5.5	22.4	16.4	45.6	34.1	41.0
33.0	31.5	60.6	11.9	53.3	10.3	35.6	5.6	33.6	5.3	23.9	18.1	44.9	31.2	34.5	60.1	11.6	51.4	10.3	35.5	5.6	22.7	16.7	46.3	34.6	41.6
33.5	32.0	61.6	12.1	54.2	10.5	36.2	5.7	34.2	5.4	24.5	18.4	45.7	31.7	35.1	61.1	11.8	52.2	10.5	36.0	5.7	23.1	17.0	47.0	35.2	42.3
	32.5	62.6	12.3	55.0	10.6	36.7	5.8	34.7	5.5	24.8	18.6	46.4	32.2	35.7	62.1	12.0	53.1	10.7	36.6	5.8	23.5	17.2	47.8	35.8	43.0
	33.0	63.6	12.4	55.9	10.8	37.3	5.9	35.2	5.6	25.2	18.9	47.2	32.7	36.3	63.0	12.2	53.9	10.9	37.1	5.9	23.8	17.5	48.5	36.3	43.6

BRIGS.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprit, Jib, and Flying Jib-boom.

Dimensions of Brigs.	BRIGS OF WAR—(continued).													BRIGS.												
	SWEDISH.													YACHT.												
	Lower-masts.				Top-mast.		Top-gallant-mast.		Bowsprit.	Jib-boom.	Flying Jib-boom.	Lower-masts.				Top-mast.		Top-gallant-mast.		Bowsprit.	Jib-boom.	Flying Jib-boom.
	Main.		Fore.		Main and Fore.		Main and Fore.					Main.		Fore.		Main and Fore.		Main and Fore.				
Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.				Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.			
20.0	37.0	5.9	33.1	5.9	21.4	3.4	14.0	9.4	30.4	21.7	21.4	40.0	7.7	35.2	6.8	22.5	3.6	15.2	8.3	29.2	23.4	23.4
20.5	37.9	6.1	33.9	6.1	21.9	3.4	14.4	9.6	31.2	22.3	21.9	41.0	7.9	36.1	7.0	23.1	3.6	15.6	8.5	29.9	23.9	23.9
21.0	38.8	6.2	34.7	6.2	22.4	3.5	14.7	9.8	31.9	22.8	22.5	42.0	8.1	37.0	7.1	23.6	3.7	16.0	8.7	30.7	24.5	24.5
21.5	39.8	6.4	35.5	6.4	23.0	3.6	15.1	10.1	32.7	23.4	23.0	43.0	8.3	37·8	7.3	24.2	3.8	16.3	8.9	31.4	25.1	25.1
22.0	40.7	6.5	36.4	6.5	23.5	3.7	15.4	10.3	33.5	23.9	23.5	44.0	8.5	38.7	7.5	24.8	3.9	16.7	9.1	32.1	25.7	25.7
22.5	41.6	6.7	37.2	6.7	24.0	3.8	15.8	10.5	34.2	24.5	24.1	45.0	8.7	39·6	7.6	25.3	4.0	17.1	9.3	32.9	26.3	26.3
23.0	42.5	6.8	38.0	6.8	24.6	3.9	16.1	10.8	35.0	25.0	24.6	46.0	8.9	40·5	7.8	25.9	4.1	17.5	9.5	33.6	26.9	26.9
23.5	43.5	7.0	38.9	7.0	25.1	3.9	16.5	11.0	35.7	25.6	25.1	47.0	9.1	41·4	8.0	26.5	4.2	17.9	9.7	34.3	27.5	27.5
24.0	44.4	7.1	39.7	7.1	25.7	4.0	16.8	11.2	36.5	26.1	25.7	48.0	9.3	42·2	8.2	27.0	4.3	18.2	9.9	35.0	28.0	28.0
24.5	45.3	7.3	40.5	7.3	26.2	4.1	17.2	11.5	37.3	26.6	26.2	49.0	9.4	43·1	8.3	27.6	4.4	18.6	10.2	35.8	28.6	28.6
25.0	46.2	7.4	41.3	7.4	26.7	4.2	17.5	11.7	38.0	27.2	26.7	50.0	9.6	44·0	8.5	28.1	4.5	19.0	10.5	36.5	29.2	29.2
25.5	47.2	7.6	42.2	7.6	27.3	4.3	17.9	11.9	38.8	27.7	27.3	51.0	9.8	44·9	8.7	28.7	4.5	19.4	10.6	37.2	29.8	29.8
26.0	48.1	7.7	43.0	7.7	27.8	4.4	18.2	12.2	39.6	28.3	27.8	52.0	10.0	45·8	8.8	29.3	4.6	19.8	10.8	38.0	30.4	30.4
26.5	49.0	7.9	43.8	7.9	28.3	4.4	18.6	12.4	40.3	28.8	28.4	53.0	10.2	46·6	9.0	29.8	4.7	20.1	11.0	38.7	31.0	31.0
27.0	49.9	8.0	44.6	8.0	28.9	4.5	18.9	12.7	41.1	29.4	28.9	54.0	10.4	47·5	9.2	30.4	4.8	20.5	11.2	39.4	31.5	31.5
27.5	50.9	8.2	45.5	8.2	29.4	4.6	19.3	12.9	41.8	29.9	29.4	55.0	10.6	48·4	9.3	31.0	4.9	20.9	11.4	40.2	32.1	32.1
28.0	51.8	8.3	46.3	8.3	29.9	4.7	19.6	13.1	42.6	30.4	30.0	56.0	10.8	49·3	9.5	31.5	5.0	21.3	11.6	40.9	32.7	32.7
28.5	52.7	8.5	47.1	8.5	30.5	4.8	19.9	13.4	43.4	31.0	30.5	57.0	11.0	50·2	9.7	32.1	5.1	21.7	11.8	41.6	33.3	33.3
29.0	53.6	8.6	48.0	8.6	31.0	4.9	20.3	13.6	44.1	31.5	31.0	58.0	11.2	51·0	9.9	32.6	5.2	22.0	12.0	42.4	33.9	33.9
29.5	54.6	8.8	48.8	8.8	31.5	5.0	20.7	13.8	44.8	32.1	31.6	59.0	11.4	51·9	10.0	33.2	5.3	22.4	12.2	43.1	34.5	34.5
30.0	55.5	8.9	49.6	8.9	32.1	5.0	21.1	14.1	45.6	32.6	32.1	60.0	11.6	52·8	10.2	33.8	5.3	22.8	12.4	43.8	35.0	35.0
30.5	56.4	9.1	50.4	9.1	32.6	5.1	21.4	14.3	46.4	33.2	32.6	61.0	11.8	53·7	10.4	34.3	5.4	23.2	12.6	44.5	35.6	35.6
31.0	57.3	9.2	51.3	9.2	33.0	5.2	21.7	14.5	47.2	33.7	33.2	62.0	12.0	54·6	10.5	34.9	5.5	23.6	12.8	45.3	36.2	36.2
31.5	58.3	9.4	52.1	9.4	33.7	5.3	22.1	14.8	47.9	34.3	33.7	63.0	12.1	55·4	10.7	35.5	5.6	23.9	13.1	46.0	36.8	36.8
32.0	59.2	9.5	52.9	9.5	34.2	5.4	22.4	15.0	48.7	34.8	34.2	64.0	12.3	56·3	10.9	36.0	5.7	24.3	13.3	46.7	37.4	37.4
32.5	60.1	9.7	53.7	9.7	34.7	5.4	22.8	15.2	49.4	35.3	34.8	65.0	12.5	57·2	11.0	36.6	5.8	24.7	13.5	47.4	38.0	38.0
33.0	61.0	9.8	54.6	9.8	35.3	5.5	23.1	15.5	50.2	35.9	35.3	66.0	12.7	58·1	11.2	37.1	5.9	25.1	13.7	48.2	38.5	38.5

Lengths of Yards and Booms.

Dimensions of Brigs.	BRIGS OF WAR.																						BRIGS.							
	FIRST EXAMPLE.								SECOND EXAMPLE.								SWEDISH.						YACHT.							
	Main and Fore-yards.				Sprit-sail-yard.	Main-boom.	Gaff.	Try-sail-gaff.	Main and Fore-yards.				Sprit-sail-yard.	Main-boom.	Gaff.	Try-sail-gaff.	Main and Fore-yards.				Main-boom.	Gaff.	Main and Fore-yards.				Sprit-sail-yard.	Main-boom.	Gaff.	Fore Try-sail-gaff.
Length on Deck.	Lower.	Top-sail.	Top-gallant.	Royal.					Lower.	Top-sail.	Top-gallant.	Royal.					Lower.	Top-sail.	Top-gallant.	Royal.			Lower.	Top-sail.	Top-gallant.	Royal.				
70	38.2	29.4	18.8	11.7	29.4	40.6	23.6	11.8	37.1	28.9	19.1	13.3	28.9	39.2	23.1	11.5	38.3	28.6	18.4	11.8	37.8	21.8	36.7	29.3	19.7	15.1	15.0	39.3	23.2	23.6
71	38.8	29.8	19.1	11.9	29.8	41.2	24.0	12.0	37.6	29.3	19.4	13.5	29.3	39.8	23.4	11.7	38.8	29.0	18.7	11.9	38.3	22.1	37.2	29.8	19.9	15.3	15.2	39.9	23.5	23.9
72	39.3	30.2	19.3	12.1	30.2	41.8	24.3	12.1	38.2	29.8	19.7	13.8	29.8	40.3	23.8	11.9	39.4	29.4	18.9	12.1	38.9	22.4	37.7	30.2	20.2	15.6	15.4	40.5	23.9	24.3
73	39.8	30.6	19.5	12.4	30.6	42.3	24.7	12.3	38.7	30.2	20.1	14.0	30.2	40.9	24.1	12.0	39.9	29.9	19.2	12.3	39.4	22.7	38.2	30.6	20.5	15.8	15.7	41.0	24.2	24.6
74	40.4	31.1	19.8	12.6	31.1	42.9	25.0	12.5	39.2	30.6	20.4	14.3	30.6	41.4	24.4	12.2	40.5	30.3	19.5	12.5	40.0	23.0	38.8	31.0	20.8	16.0	15.9	41.6	24.5	24.9
75	40.9	31.5	20.1	12.8	31.5	43.4	25.3	12.6	39.7	31.0	20.7	14.5	31.0	42.0	24.8	12.4	41.0	30.7	19.7	12.6	40.5	23.4	39.3	31.4	21.1	16.2	16.1	42.1	24.9	25.3
76	41.5	31.9	20.3	13.1	31.9	44.0	25.7	12.8	40.3	31.4	21.0	14.8	31.4	42.6	25.1	12.5	41.6	31.1	20.0	12.8	41.0	23.7	39.8	31.8	21.3	16.4	16.3	42.7	25.2	25.6
77	42.0	32.3	20.6	13.4	32.3	44.6	26.0	13.0	40.8	31.8	21.4	15.1	31.8	43.1	25.4	12.7	42.1	31.5	20.2	13.0	41.6	24.0	40.3	32.3	21.6	16.6	16.5	43.3	25.5	25.9
78	42.6	32.7	20.9	13.6	32.7	45.1	26.3	13.1	41.3	32.2	21.7	15.3	32.2	43.7	25.8	12.9	42.7	31.9	20.5	13.1	42.1	24.3	40.9	32.7	21.9	16.9	16.7	43.8	25.9	26.3
79	43.1	33.2	21.2	13.9	33.2	45.7	26.7	13.3	41.9	32.6	22.1	15.5	32.6	44.2	26.1	13.0	43.2	32.3	20.8	13.3	42.7	24.6	41.4	33.1	22.2	17.1	16.9	44.4	26.2	26.6
80	43.7	33.6	21.5	14.1	33.6	46.3	27.0	13.5	42.4	33.1	22.4	15.7	33.1	44.8	26.4	13.2	43.8	32.7	21.0	13.5	43.2	24.9	41.9	33.5	22.5	17.3	17.2	45.0	26.5	26.9
81	44.2	34.0	21.8	14.4	34.0	46.9	27.4	13.7	42.9	33.5	22.7	16.0	33.5	45.4	26.7	13.3	44.3	33.1	21.3	13.6	43.7	25.2	42.4	33.9	22.7	17.5	17.4	45.5	26.8	27.3
82	44.8	34.4	22.0	14.6	34.4	47.5	27.7	13.8	43.5	33.9	23.1	16.2	33.9	45.9	27.1	13.5	44.8	33.5	21.6	13.8	44.3	25.5	43.0	34.4	23.0	17.7	17.6	46.1	27.2	27.6
83	45.3	34.8	22.3	14.9	34.8	48.0	28.0	14.0	44.0	34.3	23.5	16.5	34.3	46.5	27.4	13.7	45.4	33.9	21.8	14.0	44.8	25.9	43.5	34.8	23.3	17.9	17.8	46.6	27.5	27.9
84	45.9	35.5	22.5	15.1	35.3	48.6	28.4	14.2	44.5	34.7	23.8	16.7	34.7	47.0	27.7	13.8	45.9	34.4	22.1	14.1	45.4	26.2	44.0	35.2	23.6	18.2	18.0	47.2	27.8	28.3
85	46.4	35.7	22.8	15.4	35.7	49.2	28.7	14.3	45.0	35.1	24.2	17.0	35.1	47.6	28.1	14.0	46.5	34.8	22.4	14.3	45.9	26.5	44.5	35.6	23.9	18.4	18.2	47.8	28.2	28.6
86	46.9	36.1	23.1	15.7	36.1	49.8	29.0	14.5	45.6	35.5	24.6	17.3	35.5	48.2	28.4	14.2	47.0	35.2	22.6	14.5	46.4	26.8	45.1	36.0	24.1	18.6	18.4	48.3	28.5	29.0
87	47.5	36.5	23.4	16.0	36.5	50.4	29.4	14.7	46.1	36.0	24.9	17.5	36.0	48.7	28.7	14.3	47.6	35.6	22.9	14.6	47.0	27.1	45.6	36.5	24.4	18.8	18.7	48.9	28.8	29.3
88	48.0	36.9	23.6	16.3	36.9	50.9	29.7	14.8	46.6	36.4	25.3	17.7	36.4	49.3	29.1	14.5	48.1	36.0	23.1	14.8	47.5	27.4	46.1	36.9	24.7	19.0	18.9	49.5	29.2	29.6
89	48.6	37.4	23.9	16.5	37.4	51.5	30.1	15.0	47.2	36.8	25.6	18.0	36.8	49.8	29.4	14.7	48.7	36.4	23.4	15.0	48.1	27.7	46.6	37.3	25.0	19.2	19.1	50.0	29.5	29.7
90	49.1	37.8	24.2	16.8	37.8	52.1	30.4	15.2	47.7	37.2	26.0	18.2	37.2	50.4	29.7	14.8	49.2	36.8	23.7	15.1	48.6	28.0	47.2	37.7	25.3	19.5	19.3	50.6	29.8	30.1

Lengths of Yards and Booms. (Continued.)

Dimensions of Brigs.		BRIGS OF WAR.																						BRIGS.							
		FIRST EXAMPLE.								SECOND EXAMPLE.								SWEDISH.						YACHT.							
		Main and Fore-yards.								Main and Fore-yards.								Main and Fore-yards.						Main and Fore-yards.							
Length when 3.2 of the Breadth	Length on Deck when 3.3 of the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Sprit-sail-yard.	Main-boom.	Gaff.	Try-sail-gaff.	Lower.	Top-sail.	Top-gallant.	Royal.	Sprit-sail-yard.	Main-boom.	Gaff	Try-sail-gaff.	Lower.	Top-sail.	Top-gallant.	Royal.	Main-boom.	Gaff.	Lower.	Top-sail.	Top-gallant.	Royal.	Sprit-sail-yard.	Main boom.	Gaff.	Fore Try-sail-gaff.
86	91	49.7	38.2	24.5	17.0	38.2	52.7	30.7	15.3	48.2	37.6	26.3	18.5	37.6	51.0	30.1	15.0	49.8	37.2	23.9	15.3	49.1	28.3	47.7	38.1	25.5	19.7	19.5	51.1	30.2	30.4
87	92	50.2	38.6	24.7	17.3	38.6	53.3	31.1	15.5	48.8	38.0	26.7	18.7	38.0	51.5	30.4	15.2	50.3	37.6	24.2	15.5	49.7	28.7	48.2	38.6	25.8	19.9	19.7	51.7	30.5	30.7
88	93	50.8	39.0	25.0	17.5	39.0	53.8	31.4	15.7	49.3	38.4	27.1	19.0	38.4	52.1	30.7	15.3	50.9	38.0	24.5	15.7	50.2	29.0	48.7	39.0	26.1	20.1	20.0	52.3	30.8	31.1
89	94	51.3	39.5	25.3	17.8	39.5	54.4	31.8	15.9	49.8	38.8	27.4	19.3	38.8	52.6	31.0	15.5	51.4	38.5	24.7	15.8	50.8	29.3	49.2	39.4	26.4	20.3	20.2	52.8	31.2	31.4
90	95	51.9	39.9	25.7	18.0	39.9	55.0	32.1	16.0	50.3	39.3	27.8	19.5	39.3	53.2	31.4	15.7	52.0	38.9	25.0	16.0	51.3	29.6	49.8	39.8	26.7	20.5	20.4	53.4	31.5	31.7
91	96	52.4	40.3	26.1	18.3	40.3	55.6	32.4	16.2	50.9	39.7	28.1	19.8	39.7	53.8	31.7	15.8	52.5	39.3	25.2	16.2	51.8	29.9	50.3	40.2	27.0	20.8	20.6	54.0	31.8	32.1
92	97	53.0	40.7	26.4	18.5	40.7	56.2	32.8	16.4	51.4	40.1	28.5	20.0	40.1	54.3	32.0	16.0	53.0	39.7	25.5	16.3	52.4	30.2	50.8	40.6	27.2	21.0	20.8	54.5	32.2	32.4
93	98	53.5	41.1	26.8	18.8	41.1	56.7	33.1	16.5	51.9	40.5	28.9	20.3	40.5	54.9	32.3	16.1	53.6	40.1	25.8	16.5	52.9	30.5	51.3	41.1	27.5	21.2	21.0	55.1	32.5	32.7
94	99	54.0	41.6	27.1	19.1	41.6	57.3	33.4	16.7	52.5	40.9	29.2	20.5	40.9	55.4	32.7	16.3	54.1	40.5	26.0	16.7	53.5	30.8	51.8	41.5	27.8	21.4	21.2	55.6	32.8	33.1
95	100	54.6	42.0	27.5	19.3	42.0	57.9	33.8	16.9	53.0	41.3	29.6	20.8	41.3	56.0	33.0	16.5	54.7	40.9	26.3	16.8	54.0	31.1	52.4	41.9	28.1	21.6	21.5	56.2	33.1	33.4
96	101	55.1	42.4	27.8	19.6	42.4	58.5	34.1	17.0	53.5	41.7	30.0	21.0	41.7	56.6	33.4	16.7	55.2	41.3	26.6	17.0	54.5	31.5	52.9	42.3	28.4	21.8	21.7	56.8	33.5	33.7
97	102	55.7	42.8	28.2	19.8	42.8	59.1	34.4	17.2	54.1	42.2	30.3	21.3	42.2	57.1	33.7	16.8	55.8	41.7	26.8	17.2	55.1	31.8	53.4	42.7	28.6	22.1	21.9	57.3	33.8	34.1
98	103	56.2	43.2	28.6	20.1	43.2	59.6	34.8	17.4	54.6	42.6	30.7	21.5	42.6	57.7	34.0	17.0	56.3	42.1	27.1	17.3	55.6	32.1	54.0	43.2	28.9	22.3	22.1	57.9	34.1	34.4
99	104	56.8	43.7	28.6	20.3	43.7	60.2	35.1	17.5	55.1	43.0	31.1	21.8	43.0	58.2	34.4	17.2	56.9	42.5	27.4	17.5	56.2	32.4	54.5	43.6	29.2	22.5	22.3	58.4	34.5	34.7
100	105	57.3	44.1	28.9	20.6	44.1	60.8	35.5	17.7	55.6	43.4	31.4	22.0	43.4	58.8	34.7	17.3	57.4	43.0	27.6	17.7	56.7	32.7	55.0	44.0	29.5	22.7	22.5	59.0	34.8	35.1
101	106	57.9	44.5	29.3	20.8	44.5	61.4	35.8	17.9	56.2	43.8	31.8	22.3	43.8	59.4	35.0	17.5	58.0	43.4	27.9	17.8	57.2	33.0	55.5	44.4	29.8	22.9	22.7	59.6	35.1	35.4
102	107	58.4	44.9	29.6	21.1	44.9	62.0	36.1	18.0	56.7	44.2	32.2	22.5	44.2	59.9	35.3	17.6	58.5	43.8	28.1	18.0	57.8	33.3	56.1	44.8	30.0	23.1	23.0	60.1	35.5	35.7
103	108	59.0	45.3	30.0	21.3	45.3	62.5	36.5	18.2	57.2	44.6	32.5	22.8	44.6	60.5	35.7	17.8	59.1	44.2	28.4	18.2	58.3	33.6	56.6	45.3	30.3	23.3	23.2	60.7	35.8	36.1
104	109	59.5	45.7	30.3	21.6	45.7	63.1	36.8	18.4	57.8	45.1	32.9	23.1	45.1	61.0	36.0	18.0	59.6	44.6	28.7	18.3	58.9	34.0	57.1	45.7	30.6	23.6	23.4	61.3	36.1	36.4
105	110	60.1	46.2	30.6	21.9	46.2	63.8	37.2	18.6	58.3	45.5	33.3	23.3	45.5	61.6	36.3	18.2	60.2	45.0	28.9	18.5	59.4	34.3	57.6	46.1	30.9	23.8	23.6	61.8	36.5	36.7

Tables showing the Proportions for the lengths of Masts, Yards, &c., with the position of the Masts and Sails, as given to Brigs.

SPECIES OF GEAR, ETC.	KNOWN QUANTITIES.	PROPORTION IN TERMS OF KNOWN QUANTITIES.			
		Brigs of War.			Yachts as Brigs.
		First Example.	Second Example.	Swedish.	
Main-mast hounded	Breadth ×	1.93	1.91	1.85	2.0
Main-mast headed	Hounded length ×	.1933	.1933	.161	.1933
Fore-mast hounded	Main-mast hounded ×	.875	.855	.894	.88
Fore-mast headed	Hounded length ×	.1933	.1933	.18	.1933
Main-top-mast hounded	Breadth ×	1.13	1.126	1.07	1.12
Main-top-mast headed	Hounded length ×	.1585	.1585	.159	.1585
Fore-top-mast hounded	Main-top-mt.hound. ×	.945	1.0	1.0	1.0
Fore-top-mast headed	Hounded length ×	.1585	.158	.159	.1585
Main-top-gallant-mast hound.	Breadth ×	.765	.722	.704	.76
Main-top-gallant-mast pole	Hounded length ×	.75	.734	.606	.546
Fore-top-gallant-mast hound.	Main-top-gallant-mast hounded ×	1.0	1.0	1.0	1.0
Fore-top-gallant-mast headed	Hounded length ×	.75	.734	.606	.546
Bowsprit	Fore-mast hounded ×	.886	.9	.92	.83
Jib-boom	Bowsprit ×	.62	.75	.711	.8
Flying jib-boom	Jib-boom ×	1.22	1.2	.984	1.0
Main-yard	Length ×	.546	.53	.547	.524
Fore-yard	Main-yard ×	1.000	1.0	1.0	1.0
Main-top-sail-yard	Main-yard ×	.769	.78	.74	.8
Main-top-gallant-yard	Main-yard ×	.492	.55	.48	.536
Main-royal-yard	Main-top-gallant ×	.712	.7	.64	.77
Fore-top-sail-yard	Main-top-sail-yard ×	1.0	1.00	1.0	1.0
Fore-top-gallant-yard	Main-top-gallt.-yard ×	1.0	1.00	1.0	1.0
Fore-royal-yard	Main-royal-yard ×	1.0	1.0	1.0	1.0
Sprit-sail-yard	Main-top-sail-yard ×	1.0	1.0	—	1.0
Main-boom	Length ×	.58	.56	.54	.562
Main-gaff	Main-boom ×	.586	.59	.577	.59
Try-sail-gaff	Gaff ×	.3	.3	—	—
Fore-try-sail-gaff	Gaff ×	.5	.5	—	.1
Swing-booms	Lower yards ×	.6	.6	—	.6
Main-mast abaft the middle	Length on the water-line ×	.147	.138	.150	.144
Fore-mast before the middle.	Length on the water-line ×	.331	.323	.309	.323
Main-mast to rake	In 12 feet ×	10 in.	9 in.	11 in.	10 in.
Fore-mast to rake	In 12 feet ×	3 in.	2 in.	3 in.	2½ in.
Bowsprit to stive	In 12 feet ×	51 in.	48 in.	51 in.	52 in.
Main-mast below the load-water-line	Breadth ×	.245	.255	.28	.31
Fore-mast below the load-water-line	Breadth ×	.2	.224	.24	.3
Bowsprit housed from the fore part of the stem	Breadth ×	.5	.53	.5	.5
Centre of effort from the middle of the length	Length of water-line ×	.026	.0334	.025	.053
Height of centre of effort	Breadth ×	1.5	1.54	1.51	1.51
Area of sail	Area of loadwater section ×	3.74	3.73	3.56	3.52
Moment of sail	Area of loadwater section ×	175.8	141.1	159.6	111.4
Difference of draught of water excess aft	Length of water-line ×	.035	.011	.03	.01
Length on deck		100 feet.	90.	107.7	78.2
Breadth extreme		30.5	24.5	29.6	21.0
Relation of the moment of sail before the middle to the moment abaft	Fore to the after as 1 to	.83	.79	.84	.7

On Masting Ships.

The system of sails is the most complicated in ships, on account of the number of masts, &c., and the mode of support; but so long as the surface of sail is not too limited, nor the dimensions of the vessel too small, in relation to the appendages which this system requires, its complication rather adds to its excellence than otherwise, by affording a facility for repairing damages, whether received accidentally or in action.

This system enables us to give that firmness to the masts of large ships, which the great pressure of the sails renders necessary. The sails are so divided as to be managed with the greater ease, and can be increased or diminished to any desirable extent.

The equalizing of the masts and yards appears to possess some advantages, as it respects simplicity, and the convenience of replacing damages. It has long had many advocates; and in France we find that, as far back as the year 1766, a ship was fitted, as an experiment, with the fore and main masts alike; but to obtain all the advantages this offers, the fore and main yards must be alike, so that the top-sails may be used for each other indiscriminately; for if the top-masts &c., *only* are considered, and not the sails, most of the advantages may be obtained by giving them the same diameters. To make the fore and main yards alike, and still to maintain equal bend for the courses, the fore-yard must be lengthened as much as the main-yard is shortened. But this presents some practical disadvantages; for, in order to bring down the fore-tack, as at present, the fore-sail was made considerably smaller at the foot, than at the bend or head; whereas, if the fore-sail were as broad at the foot as the main-sail, the fore-mast must be carried aft; which arrangement will render the yards more liable to lock, and the sails less effective, and very probably prevent the ship from properly working, or make it plunge heavily.

As to the relation that the top-masts should bear to the lower-masts, it is desirable that they should be as long as circumstances will admit, while they can be struck with ease; for it is under the top-sails that many important evolutions are made, especially in time of action; and though they may not be so easily worked as when they are small and the courses large, yet this disadvantage is trifling when compared with the advantages which ships of war experience from their being large.

In placing the masts of ships, they may be varied in their disposition by being more separated or concentrated, while the centre of effort of sails may remain in its proper place, in relation to the form, and the masts may be bodily further forward or aft than their proper disposition, and still by varying the draught of water, and bringing the ship more or less by the stern, we may obtain a proper helm; but it is only to certain limits that this can be carried, for the best effect to be produced; for in one case we effect the proper working of the ship (36), and, in the other, the angular inertia is increased, from which cause the ship may become uneasy; and constant experience proves, that when the masts have been placed beyond the prescribed limits, these have been the consequences, and especially with the fore-mast, as producing the most influence in working the ship: through its action on the body when heavily pressed, the fore-mast has seldom been carried forward to exceed .4 the length of the water-line from the middle, but it has been necessary to shift it aft; and it has seldom been placed nearer to the middle than .34 the length of the water-line, but it has been found necessary to carry it forward, when the common proportion of sail is placed upon it. In some of the American ships, these limits have been exceeded, by the fore-mast being placed at .34 before, and then the main .10 the length of the water-line abaft the middle; but it will be found that their form assimilates to the brig, and consequently requires such a disposition. Greater limits may be given in placing the main-mast, as we find it varies, in ships that have been properly masted, from .05 to .079 the length of the water-line abaft the middle, without bad consequences; however, on comparing the after moments, it would appear that some of the ships from which this data has been obtained, would be improved, if their main-masts were further aft.

In the length of the lower-yards, we are confined within certain limits, to prevent inconvenience in working them; and while the top-sail and top-gallant-yards may be increased without this inconvenience, and advantages may be obtained by having them as long as possible, to get an increased area under the same moment, it would still be dangerous to extend them too far, since there would be difficulty in giving proper support to their masts.

In English ships, the main-yard is seldom to a greater extent than .55, top-sail-yards .44, and top-gallant-yards .28 of the length of the deck; in Swedish ships, the main-yards .56, top-sail-yards .41, and top-gallant-yards .3 of the length; and in French ships, main-yards .57, top-sail .41, and top-gallant .29 of the length, with the fore-yards seldom exceeding from .89 to .9 the main: much to exceed these proportions, whatever may be the stability of the body, as it regards the lower-yards, would be to lessen the effect of the wind on the sails, and as it respects the upper-yards, to endanger their having the proper support.

The proportions given in the following Tables will show the limits as derived from several ships of each class that have been known to answer well, as to the proportions of their masts and yards, and as regards the power and position of sail.

These Tables are formed from the lengths and breadths of such ships of each rate, as from experience are found to have their masts and yards well proportioned, according to these elements, and may be considered useful to consult, in fixing the masts, yards, &c., of new classes of ships. In many cases, the masts and yards thus determined, without forming any other comparison, may answer; but in some cases it would be dangerous, and in others, if no important evil should result, yet the best possible effects may not be produced. In these Tables, the first column shows the length or breadth of the ship, and the others the lengths of the masts, yards, &c., in feet and decimal parts. The whole of the proportions and lengths of masts, yards, &c., in the Tables, as given for ships, brigs, cutters, &c., are drawn out from ships as they were actually masted; but in masting ships it may be well to consult the supplementary Tables at the end, as giving proportions better defined. When it is required to determine the given length of mast from the lengths given in hounding, they will require to be multiplied, for lower-masts, by 1.1612; for top-masts, by 1.125; and for top-gallant-masts, by 1.108.

The advantages attending our having different classes of masts and yards for convenience and simplicity, and for readily supplying ships of different rates, would, from the difference in the relative length and breadth of different ships, in each rate, prevent their general use; however, from what has been before shown, as to the necessity of the proper proportions, in relation to the hull, to produce the greatest degree of excellence, and as to the limits that it would be dangerous to exceed, we should, in appropriating the classes of masts to the different rates, endeavour to bring them as near the Table as the different circumstances will admit, while we attend to the form; as we have experience on our side, to show their suitability to the dimensions of the hull.

To obtain the advantages of bringing ships under different establishments, as at present regulated, it becomes frequently necessary either to make a sacrifice, by a loss of power in the masts or yards, or to carry them beyond the proper limits. In the largest class of frigates, to preserve the establishment of the 64-gun ship, we find that, while the masts are nearly in the proper terms of the breadth, the yards are considerably too short for the length; as these ships, while they are nearly the same breadth as the old 64's, are from 13 to 16 feet longer; which would allow of their having five or six feet more main-yard, to bring them in the same terms of the length of the common 74 or old 64, the yards of which ships have been found to be well proportioned. In this case, therefore, by preserving the establishment, we lose a considerable power of sail, which, by comparing stabilities, does not appear necessary; but, on the contrary, the decrease of top weight, and the action of the wind on the higher top side of the 74 and 64, give a further advantage to the frigate. Again: To preserve the establishment of the 46 and 42-gun frigates, it appears that some of these ships, with 20 inches less breadth, have the same length of mast; and that others, with the same breadth, have masts two feet more hounded, occasioned by the difference of the relative length and breadth. From these and other examples that might be given, it appears that to preserve the establishments, it is likely that, while some ships are under-masted, others are over-masted; thus, while we preserve the convenience, we do not obtain the best effects. In some degree, by having separate classes for the masts and yards, and having the supply defined under certain limits of their length and breadth, a good classification may be observed; but it would be more consistent, and the best effect would be produced, by having a classification of mast, yard, and sails, with the moment given for each set, which should be selected by the moment being in a certain relation to the stability of the body. See Tables of Moments and Stabilities, in Appendix (1) at the end.

TABLE :—*Showing the Proportions for the Lengths of Masts, Yards, &c., as given to Ships of different Classes.*

SPECIES OF MAST AND GEAR.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.												
		Corvettes.			Frigates.					2-Deck Ships.			3-Deck Ships.	
		First Example.	Second Example.	Swedish.	Yacht.	First Example.	Second Example.	Third Example.	Fourth Example.	First Example.	Second Example.	Swedish.	First Example.	Second Example.
Main-mast hounded	Breadth ×	1.99	2.02	1.963	2.12	1.94	2.05	1.94	1.95	1.93	1.97	1.95	1.992	1.94
Main-mast headed	Hounded length ×	.1933	.1933	.159	.1933	.1933	.1933	.1933	.1933	.1933	.1933	.177	.1933	.1933
Fore-mast hounded	Main-mast hounded ×	.91	.903	.924	.919	.91	.91	.917	.92	.91	.91	.93	.93	.89
Fore-mast headed	Hounded length ×	.1933	.1933	.157	.1933	.1933	.1933	.1933	.1933	.1933	.1933	.168	.1933	.1933
Mizen-mast hounded	Main-mast hounded ×	.85	.863	.866	.89	.773	.754	.73	.737	.7	.7	.716	.69	.71
Mizen-mast headed	Hounded length ×	.161	.156	.134	.156	.156	.156	.156	.156	.156	.156	.176	.156	.156
Main-top-mast hounded	Breadth ×	1.26	1.27	1.16	1.33	1.15	1.29	1.16	1.11	1.18	1.155	1.16	1.21	1.16
Main-top-mast headed	Hounded length ×	.154	.154	.144	.156	.156	.156	.156	.156	.156	.156	.155	.156	.156
Fore-top-mast hounded	Main-top-mast hounded ×	.87	.895	.887	.93	.91	.893	.9	.9	.88	.9	.887	.95	.89
Fore-top-mast headed	Hounded length ×	.154	.154	.146	.156	.156	.156	.156	.156	.156	.156	.155	.156	.156
Mizen-top-mast hounded	Main-top-mast hounded ×	.702	.725	.722	.7	.77	.737	.755	.72	.736	.71	.715	.7	.71
Mizen-top-mast headed	Hounded length ×	.154	.154	.139	.156	.156	.156	.156	.156	.156	.156	.155	.156	.156
Main-top-gallant-mast hounded	Breadth ×	.7	.683	.62	.7	.61	.657	.6	.57	.61	.6	.699	.61	.6
Main-top-gallant-mast pole	Hounded length ×	.75	.72	.675	.7	.75	.735	.75	.8	.75	.75	.639	.75	.75
Fore-top-gallant-mast hounded	Main-top-gallant-mast hounded ×	.9	.93	.875	.87	.9	.92	.9	.9	.8	.85	.882	.96	.89
Fore-top-gallant-mast pole	Hounded length ×	.75	.72	.675	.7	.75	.735	.75	.8	.75	.75	.66	.75	.75
Mizen-top-gallant-mast hounded	Main-top-gallant-mast hounded ×	.7	.648	.718	.73	.75	.75	.75	.74	.72	.7	.72	.666	.66
Mizen-top-gallant-mast pole	Hounded length ×	.7	.72	.678	.7	.75	.735	.75	.8	.75	.75	.66	.75	.75
Bowsprit	Fore-mast hounded ×	.643	.65	.797	.68	.8	.81	.77	.758	.778	.777	.81	.759	.82
Jib-boom	Bowsprit ×	.797	.78	.76	.76	.733	.71	.71	.72	.74	.7	.705	.75	.7
Flying-jib-boom	Jib-boom ×	1.22	1.2	.659	1.0	1.1	1.02	1.2	1.2	1.37	1.13	.961	1.2	1.2
Main-yard	Length ×	.54	.541	.559	.543	.553	.59	.54	.53	.54	.53	.548	.53	.533
Main-top-sail-yard	Main-yard ×	.784	.708	.732	.75	.74	.74	.719	.726	.72	.721	.767	.73	.716
Main-top-gallant-yard	Main-top-sail-yard ×	.646	.7	.652	.62	.61	.606	.63	.6	.65	.62	.657	.65	.662
Main-royal-yard	Main-top-gallant yard ×	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.76	.7	.75
Fore-yard	Main-yard ×	.9	.88	.896	.9	.873	.87	.876	.883	.872	.87	.89	.86	.9
Fore-top-sail-yard	Main-top-sail-yard ×	.9	.9	.86	.9	.879	.87	.946	.87	.87	.872	.895	.88	.9
Fore-top-gallant-yard	Main-top-gallant-yard ×	.9	.9	.88	.9	.88	.88	.87	.86	.87	.841	.91	.89	.9
Fore-royal-yard	Fore-top-gallant-yard ×	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.76	.7	.76
Cross-jack-yard	Main-top-sail-yard ×	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.947	1.0	1.0
Mizen-top-sail	Ditto ditto ×	.65	.744	.713	.7	.665	.665	.774	.66	.653	.66	.721	.66	.72
Mizen-top-gallant	Main-top-gallant-yard ×	.69	.67	.695	.7	.753	.75	.658	.76	.69	.73	.74	.69	.74
Mizen-royal	Mizen-top-gallant-yard ×	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.76	.7	.78
Sprit-sail-yard	Fore-top-sail-yard ×	1.0	1.0	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0	—	1.0	1.0
Driver-boom	Length ×	.37	.4	.4	.4	.395	.41	.367	.348	.37	.362	.363	.36	.35
Gaff	Driver-boom ×	.754	.774	.595	.72	.724	.73	.759	.75	.75	.75	.681	.75	.78
Try-sail-gaff	Gaff ×	.3	.3	—	.3	.3	.3	.3	.3	.3	.3	fore. .6	.3	.3
Main-try-sail-gaff	Ditto ×	.6	.6	—	.6	.6	.6	.6	.6	.6	.6	.66	.6	.6
Swing-boom	Main-yard ×	.6	.6	—	.6	.6	.6	.6	.6	.6	.6	—	.6	.6

TABLE *showing the Positions of the Masts, Sails, &c., of Ships of different Classes.*

SPECIES OF MAST AND GEAR.	KNOWN QUANTITIES, ETC.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.												
		CORVETTES.			FRIGATES.					TWO-DECK SHIPS.			THREE-DECK SHIPS.	
		First Example.	Second Example.	Swedish.	Yacht.	First Example.	Second Example.	Third Example.	Fourth Example.	First Example.	Second Example.	Swedish.	First Example.	Second Example.
Fore-mast before the middle of the length of the water-line, taken from fore-part of stem to after-part of stern-post......	Length of water-line ×	.372	.399	.353	.37	.37	.364	.374	.39	.38	.38	.358	.38	.38
Main-mast abaft ditto......	Length of water-line ×	.079	.06	.069	.067	.062	.073	.059	.0685	.062	.067	.0757	.05	.05
Mizen-mast abaft ditto	Length of water-line ×	.375	.356	.261	.347	.341	.35	.335	.404	.34	.33	.331	.375	.348
Rake of Fore-mast	In 12 feet	2 in.	1¼ in.	4 in.	2 in.	2 in.	1¼ in.	1½ in.	1 in.	1 in.	1 in.	.000	1 in.	3 in.
Main-mast........	In 12 feet	6 in.	10½ in.	8 in.	7 in.	6 in.	5½ in.	5 in.	5 in.	3 in.	3 in.	4 in.	3 in.	6 in.
Mizen-mast	In 12 feet	10 in.	10¼ in.	12 in.	12 in.	10 in.	11 in.	9 in.	9 in.	7 in.	7 in.	9 in.	6 in.	9 in.
Stive of Bowsprit	In 12 feet	64 in.	50 in.	51 in.	54 in.	63 in.	54 in.	60 in.	60 in.	72 in.	72 in.	69 in.	72 in.	72 in.
Main-mast below water-line	Breadth .... ×	.28	.3	.26	.31	.3	.25	.3	.31	.31	.33	.3	.34	.339
Fore-mast below water-line.	Breadth .... ×	.206	.22	.22	.24	.25	.24	.23	.24	.24	.29	.245	.31	.31
Mizen-mt. below water-line	Breadth .... ×	.26	.266	.2	.26	.06	.055	.005	.00	.09	.09	above ——	.09	.09
Bowsprit housed from fore-part of the stem ..	Breadth .... ×	.5	.4	.54	.4	.46	.54	.39	.37	.5	.5	.53	.42	.43
Centre of effort before the mid. of the water-line ..	Length of water-line ×	.038	.048	.042	.047	.059	.048	.052	.05	.058	.056	.038	.058	.056
Height of centre of effort..	Breadth .... ×	1.65	1.6	1.63	1.71	1.56	1.71	1.6	1.61	1.62	1.65	1.71	1.68	
Area of Sail	Area of ld. wtr. sect. ×	3.87	3.72	3.76	3.6	3.14	3.74	3.4	3.2	3.01	2.97	3.25	2.9	2.95
Moments of Sail	Area of ld. wtr. sect. ×	195.6	177.8	181.4	171.6	160.0	216.7	232.0	231.0	232.5	231.6	273.8	262.5	270.
Difference of draught of water excess aft........	Length of water-line ×	.0081	.0074	.0093	.0099	.005	.007	.006	.007	.008	.006	.005	.006	.004
Relation of Moment of Sails before the middle to the moment abaft......	Fore to the after as 1 to	.77	.73	.74	.74	.69	.72	.69	.7	.68	.69	.77	.68	.68
Length on Deck..........	Feet	113.5	110.0	107.7	103.0	113.75	122.5	159.25	174.0	176.0	193.8	181.4	205.0	186.
Breadth extreme..........	Feet	30.5	30.0	29.5	27.2	31.83	33.75	42.63	45.0	47.5	51.5	48.9	53.5	51.6

CORVETTES.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Breadth, when the Breadth is .27 the Length.	Dimensions of Ship.	FIRST EXAMPLE.																				
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying Jib-boom.
	Breadth, when the Breadth is .26 the Length.	Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main		Fore.		Mizen.				
		Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
28.0	27.0	53.7	10.4	48.9	9.4	45.7	7.3	32.8	5.2	29.6	4.5	23.9	3.7	18.9	14.2	17.0	12.7	13.2	9.9	36.9	29.4	35.3
28.5	27.5	54.7	10.6	49.8	9.6	46.5	7.5	33.4	5.3	30.1	4.6	24.3	3.7	19.2	14.4	17.3	13.0	13.5	10.1	37.6	30.0	36.0
29.0	28.0	55.7	10.8	50.7	9.8	47.4	7.6	34.0	5.4	30.7	4.7	24.8	3.8	19.6	14.7	17.6	13.2	13.7	10.3	38.2	30.5	36.6
29.5	28.5	56.7	11.0	51.6	10.0	48.2	7.8	34.6	5.5	31.2	4.8	25.2	3.9	19.9	15.0	17.9	13.5	14.0	10.5	38.9	31.0	37.2
30.0	29.0	57.7	11.1	52.5	10.1	49.0	7.9	35.3	5.6	31.8	4.9	25.6	3.9	20.3	15.2	18.3	13.7	14.2	10.6	39.5	31.5	37.8
30.5	29.5	58.7	11.3	53.4	10.3	49.9	8.0	35.9	5.7	32.3	5.0	26.1	4.0	20.6	15.5	18.6	13.9	14.4	10.8	40.1	32.0	38.4
31.0	30.0	59.7	11.5	54.3	10.5	50.7	8.2	36.5	5.8	32.9	5.1	26.5	4.1	21.0	15.7	18.9	14.2	14.7	11.0	40.8	32.5	39.0
31.5	30.5	60.7	11.7	55.2	10.7	51.6	8.3	37.2	5.9	33.4	5.1	27.0	4.1	21.4	16.0	19.2	14.4	14.9	11.2	41.4	33.0	39.6
32.0	31.0	61.7	11.9	56.1	10.8	52.4	8.4	37.8	6.0	34.0	5.2	27.4	4.2	21.7	16.3	19.5	14.6	15.2	11.4	42.0	33.5	40.2
32.5	31.5	62.7	12.1	57.0	11.0	53.3	8.6	38.4	6.1	34.5	5.3	27.9	4.3	22.0	16.5	19.8	14.9	15.4	11.6	42.7	34.0	40.8
33.0	32.0	63.7	12.3	57.9	11.2	54.1	8.7	39.1	6.2	35.1	5.4	28.3	4.3	22.4	16.8	20.1	15.1	15.7	11.7	43.3	34.5	41.4
33.5	32.5	64.7	12.5	58.8	11.4	55.0	8.8	39.7	6.3	35.6	5.4	28.7	4.4	22.7	17.0	20.5	15.3	15.9	11.9	44.0	35.0	42.0
34.0	33.0	65.7	12.7	59.7	11.5	55.8	9.0	40.3	6.4	36.2	5.5	29.2	4.5	23.1	17.3	20.8	15.6	16.2	12.1	44.6	35.5	42.6
34.5	33.5	66.7	12.9	60.7	11.7	56.7	9.1	40.9	6.5	36.7	5.6	29.6	4.6	23.4	17.6	21.1	15.8	16.4	12.3	45.2	36.0	43.2
35.0	34.0	67.7	13.1	61.6	11.9	57.5	9.2	41.6	6.6	37.3	5.7	30.1	4.6	23.7	17.8	21.4	16.1	16.7	12.5	45.9	36.6	43.9
35.5	34.5	68.6	13.3	62.5	12.1	58.3	9.4	42.2	6.7	37.8	5.8	30.5	4.7	24.1	18.1	21.7	16.3	16.9	12.7	46.5	37.1	44.6
36.0	35.0	69.6	13.5	63.4	12.2	59.2	9.5	42.8	6.8	38.4	5.9	31.0	4.8	24.5	18.4	22.0	16.5	17.1	12.8	48.2	37.6	45.1
36.5	35.5	70.6	13.7	64.3	12.4	60.0	9.7	43.5	6.9	38.9	6.0	31.4	4.8	24.8	18.6	22.4	16.8	17.4	13.0	48.8	38.1	45.7
37.0	36.0	71.6	13.8	65.2	12.6	60.9	9.8	44.1	7.0	39.5	6.1	31.8	4.9	25.2	18.9	22.7	17.1	17.6	13.2	49.5	38.6	46.3

CORVETTES.

(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Breadth, when the Breadth is .31 the Length.	Dimensions of Ship.	SECOND EXAMPLE.																			
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying Jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
	Breadth, when the Breadth is .26 the Length.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
32.0	27.0	54.5	10.5	49.2	9.5	47.1	7.3	33.6	5.3	30.7	4.7	21.6	3.5	18.4	13.3	17.1	12.3	11.9	8.6	39.2	30.6	36.7
32.5	27.5	55.5	10.7	50.2	9.7	47.9	7.5	34.3	5.4	31.2	4.8	22.1	3.5	18.8	13.5	17.5	12.6	12.2	8.8	39.6	30.9	37.1
33.0	28.0	56.5	10.9	51.1	9.9	48.8	7.6	34.9	5.5	31.8	4.9	22.6	3.6	19.1	13.8	17.8	12.8	12.4	8.9	40.6	31.7	38.0
33.5	28.5	57.6	11.1	52.0	10.0	49.7	7.8	35.6	5.6	32.4	5.0	23.1	3.7	19.5	14.0	18.1	13.0	12.6	9.1	41.0	32.0	38.4
34.0	29.0	58.6	11.3	52.9	10.2	50.5	7.9	36.2	5.7	33.0	5.1	23.7	3.7	19.8	14.3	18.4	13.3	12.8	9.2	41.8	32.6	39.1
34.5	29.5	59.6	11.5	53.8	10.4	51.4	8.0	36.8	5.8	33.5	5.2	24.3	3.8	20.1	14.5	18.7	13.5	13.0	9.4	42.5	33.1	39.7
35.0	30.0	60.6	11.7	54.7	10.6	52.3	8.2	37.5	5.9	34.1	5.2	24.9	3.9	20.5	14.7	19.0	13.7	13.3	9.6	43.0	33.5	40.2
35.5	30.5	61.6	11.9	55.6	10.7	53.2	8.3	38.1	6.0	34.7	5.3	25.3	4.0	20.8	15.0	19.4	13.9	13.5	9.7	43.6	34.0	40.8
36.0	31.0	62.6	12.1	56.5	10.9	54.0	8.4	38.7	6.1	35.2	5.4	25.8	4.0	21.2	15.2	19.7	14.2	13.7	9.9	44.2	34.5	41.4
36.5	31.5	63.6	12.3	57.4	11.1	54.9	8.6	39.4	6.2	35.8	5.5	26.2	4.1	21.5	15.5	20.0	14.4	13.9	10.0	44.8	34.9	41.9
37.0	32.0	64.6	12.5	58.4	11.3	55.8	8.7	40.0	6.2	36.4	5.6	26.7	4.2	21.8	15.7	20.3	14.6	14.2	10.2	45.4	35.4	42.5
37.5	32.5	65.6	12.7	59.3	11.4	56.6	8.8	40.6	6.3	36.9	5.7	27.2	4.2	22.2	16.0	20.6	14.9	14.4	10.3	46.0	35.9	43.1
38.0	33.0	66.6	12.9	60.2	11.6	57.5	9.0	41.3	6.4	37.5	5.8	27.6	4.3	22.5	16.2	21.0	15.1	14.6	10.5	46.6	36.3	43.6
38.5	33.5	67.6	13.1	61.1	11.8	58.4	9.1	41.9	6.5	38.1	5.9	28.1	4.4	22.9	16.5	21.3	15.3	14.8	10.7	47.2	36.8	44.2
39.0	34.0	68.7	13.3	62.0	12.0	59.3	9.2	42.5	6.6	38.6	5.9	28.5	4.5	23.2	16.7	21.6	15.5	15.0	10.8	47.8	37.3	44.8
39.5	34.5	69.7	13.5	62.9	12.2	60.1	9.4	43.2	6.7	39.2	6.0	29.0	4.6	23.6	17.0	21.9	15.8	15.3	11.0	48.4	37.7	45.2
40.0	35.0	70.7	13.7	63.8	12.3	61.0	9.5	43.8	6.8	39.8	6.1	29.5	4.7	23.9	17.2	22.2	16.0	15.5	11.1	49.0	38.2	45.8
40.5	35.5	71.7	13.9	64.7	12.5	61.9	9.7	44.4	6.9	40.3	6.2	29.9	4.7	24.2	17.4	22.5	16.2	15.7	11.3	49.6	38.7	46.4
41.0	36.0	72.7	14.1	65.7	12.7	62.7	9.8	45.1	7.0	40.9	6.3	30.4	4.8	24.6	17.7	22.9	16.5	15.9	11.5	50.2	39.1	46.9

CORVETTES—(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Dimensions of Ship.	SWEDISH CORVETTE.																				
	LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
	Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
26.0	51.0	8.1	47.1	7.4	44.5	6.0	30.3	4.4	26.9	3.9	22.0	3.0	16.2	10.9	14.2	9.6	11.7	7.9	37.5	28.6	22.6
26.5	52.0	8.3	48.1	7.5	45.3	6.1	30.9	4.4	27.4	4.0	22.4	3.1	16.5	11.2	14.5	9.8	11.9	8.1	38.3	29.1	23.1
27.0	53.0	8.4	49.0	7.7	46.1	6.2	31.4	4.5	27.9	4.0	22.8	3.2	16.8	11.4	14.7	9.9	12.1	8.2	39.0	29.7	23.5
27.5	54.0	8.6	49.9	7.8	46.8	6.3	32.0	4.6	28.4	4.1	23.3	3.2	17.2	11.6	15.0	10.1	12.3	8.4	39.7	30.2	24.0
28.0	55.0	8.7	50.8	8.0	47.6	6.4	32.6	4.7	28.9	4.2	23.7	3.3	17.5	11.8	15.3	10.3	12.6	8.5	40.5	30.8	24.4
28.5	56.0	8.9	51.7	8.1	48.4	6.5	33.2	4.8	29.4	4.3	24.1	3.3	17.8	12.0	15.6	10.5	12.8	8.7	41.2	31.3	24.8
29.0	57.0	9.0	52.6	8.2	49.2	6.6	33.8	4.9	30.0	4.3	24.5	3.4	18.1	12.2	15.8	10.7	13.0	8.8	41.9	31.9	25.3
29.5	58.0	9.2	53.5	8.4	49.8	6.7	34.4	4.9	30.5	4.4	24.9	3.5	18.4	12.4	16.1	10.9	13.2	9.0	42.6	32.4	25.7
30.0	59.0	9.4	54.4	8.5	50.6	6.8	34.9	5.0	31.0	4.5	25.4	3.5	18.7	12.6	16.4	11.1	13.5	9.1	43.4	32.9	26.1
30.5	60.0	9.5	55.3	8.7	51.4	6.9	35.5	5.1	31.5	4.6	25.8	3.6	19.0	12.8	16.6	11.2	13.7	9.3	44.1	33.5	26.6
31.0	61.0	9.7	56.2	8.8	52.1	7.0	36.1	5.2	32.0	4.6	26.2	3.6	19.3	13.1	16.9	11.4	13.9	9.4	44.8	34.0	27.0
31.5	62.0	9.8	57.1	9.0	52.9	7.1	36.7	5.3	32.5	4.7	26.6	3.7	19.7	13.3	17.2	11.6	14.1	9.6	45.5	34.6	27.4
32.0	63.0	10.0	58.0	9.1	53.6	7.2	37.3	5.4	33.1	4.8	27.1	3.8	19.9	13.5	17.5	11.8	14.4	9.7	46.2	35.1	27.9
32.5	64.0	10.1	58.9	9.2	54.4	7.3	37.9	5.4	33.5	4.9	27.5	3.8	20.1	13.7	17.8	12.0	14.6	9.9	47.0	35.7	28.3
33.0	65.0	10.3	59.8	9.4	55.2	7.4	38.4	5.5	34.1	4.9	27.9	3.9	20.6	13.9	18.0	12.2	14.7	10.0	47.7	36.2	28.7
33.5	66.0	10.4	60.8	9.5	56.0	7.5	39.0	5.6	34.6	5.0	28.3	3.9	20.8	14.1	18.3	12.3	15.0	10.1	48.4	36.8	29.2
34.0	67.0	10.6	61.7	9.7	56.8	7.6	39.6	5.7	35.1	5.1	28.8	4.0	21.1	14.3	18.6	12.5	15.2	10.3	49.1	37.3	29.6
34.5	68.0	10.8	62.6	9.8	57.6	7.7	40.2	5.8	35.7	5.2	29.2	4.0	21.4	14.5	18.8	12.7	15.5	10.5	49.9	37.9	30.1
35.0	69.0	11.0	63.5	10.0	58.4	7.8	40.8	5.9	36.2	5.2	29.6	4.1	21.7	14.7	19.1	12.9	15.7	10.6	50.6	38.4	30.4
35.5	70.0	11.1	64.4	10.1	59.2	7.9	41.3	5.9	36.7	5.3	30.0	4.2	22.0	14.9	19.4	13.1	15.9	10.8	51.3	39.0	30.9
36.0	71.0	11.2	65.3	10.2	60.0	8.0	41.9	6.0	37.2	5.4	30.4	4.2	22.4	15.1	19.7	13.3	16.1	10.9	52.0	39.5	31.3

CORVETTES—(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Dimensions.		YACHT RIGGED AS A SHIP.																				
		LOWER MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore		Mizen.		Main		Fore.		Mizen.				
Breadth when .31 the length.	Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
		2.12	.1933	.919	.1933	.89	.156	1.33	.156	.93	.156	.7	.156	.7	.7	.87	.7	.73	.7	.68	.76	1.0
30.5	26.0	55.1	10.6	50.5	9.8	49.0	7.6	34.6	5.4	32.1	5.0	20.6	4.1	18.2	12.7	15.8	11.1	13.3	9.3	40.4	30.7	30.7
31.0	26.5	56.2	10.8	51.4	10.0	50.0	7.8	35.2	5.5	32.8	5.1	21.0	4.1	18.5	13.0	16.1	11.3	13.5	9.5	41.1	31.2	31.2
31.5	27.0	57.2	11.1	52.4	10.2	50.9	7.9	35.9	5.6	33.4	5.2	21.3	4.2	18.9	13.2	16.4	11.5	13.8	9.6	41.7	31.7	31.7
32.0	27.5	58.3	11.3	53.4	10.3	51.9	8.1	36.5	5.7	34.0	5.3	21.7	4.3	19.2	13.5	16.7	11.7	14.0	9.8	42.3	32.1	32.1
32.5	28.0	59.4	11.5	54.3	10.5	52.8	8.2	37.2	5.8	34.6	5.4	22.1	4.4	19.6	13.7	17.0	11.9	14.3	10.0	43.0	32.7	32.7
33.0	28.5	60.4	11.7	55.3	10.7	53.8	8.4	37.9	5.9	35.2	5.5	22.5	4.4	19.9	14.0	17.3	12.1	14.6	10.2	43.7	33.2	33.2
33.5	29.0	61.5	11.9	56.3	10.9	54.7	8.5	38.6	6.0	35.9	5.6	22.9	4.5	20.3	14.2	17.6	12.4	14.8	10.4	44.4	33.7	33.7
34.0	29.5	62.5	12.1	57.3	11.1	55.7	8.7	39.2	6.1	36.5	5.7	23.3	4.6	20.6	14.4	17.9	12.6	15.1	10.5	15.0	34.2	34.2
34.5	30.0	63.6	12.3	58.2	11.3	56.6	8.8	39.9	6.2	37.1	5.8	23.7	4.6	21.0	14.7	18.3	12.8	15.3	10.7	45.7	34.7	34.7
35.0	30.5	64.7	12.5	59.2	11.5	57.5	9.0	40.6	6.3	37.7	5.9	24.1	4.7	21.3	14.9	18.6	13.0	15.6	10.9	46.4	35.3	35.3
35.5	31.0	65.7	12.7	60.2	11.7	58.5	9.1	41.2	6.4	38.3	6.0	24.5	4.8	21.7	15.2	18.9	13.2	15.8	11.1	47.0	35.7	35.7
36.0	31.5	66.8	12.9	61.2	11.9	59.4	9.3	41.9	6.5	39.0	6.1	24.9	4.9	22.0	15.4	19.2	13.4	16.1	11.3	47.7	36.2	36.2
36.5	32.0	67.8	13.1	62.2	12.0	60.4	9.4	42.6	6.6	39.6	6.2	25.3	5.0	22.4	15.7	19.5	13.6	16.3	11.4	48.4	36.8	36.8
37.0	32.5	68.9	13.3	63.2	12.2	61.3	9.6	43.2	6.7	40.2	6.3	25.7	5.1	22.7	15.9	19.8	13.8	16.6	11.6	49.1	37.2	37.2
37.5	33.0	70.0	13.5	64.1	12.4	62.3	9.7	43.9	6.8	40.8	6.4	26.1	5.1	23.1	16.2	20.1	14.0	16.9	11.8	49.8	37.8	37.8
38.0	33.5	71.0	13.7	65.1	12.6	63.2	9.9	44.5	6.9	41.4	6.5	26.4	5.2	23.4	16.4	20.4	14.3	17.1	12.0	50.5	38.4	38.4
38.5	34.0	72.1	13.9	66.1	12.8	64.1	10.0	45.2	7.0	42.0	6.6	26.9	5.3	23.8	16.7	20.7	14.5	17.4	12.2	51.2	38.9	38.9
39.0	34.5	73.1	14.1	67.0	13.0	65.1	10.1	45.9	7.1	42.7	6.6	27.4	5.4	24.1	16.9	21.0	14.7	17.6	12.3	51.9	39.4	39.4
39.5	35.0	74.2	14.3	68.0	13.2	66.0	10.3	46.5	7.3	43.4	6.7	27.7	5.5	24.5	17.1	21.3	14.9	17.9	12.5	52.6	40.0	40.0
40.0	35.5	75.3	14.5	69.0	13.3	67.0	10.4	47.2	7.4	43.9	6.8	28.1	5.6	24.8	17.4	21.6	15.1	18.1	12.7	53.0	40.5	40.5
40.5	36.0	76.3	14.7	70.0	13.5	67.9	10.6	47.9	7.5	44.5	6.9	28.4	5.6	25.2	17.6	21.9	15.3	18.4	12.9	54.0	41.0	41.0

CORVETTES—(*Continued.*)

Lengths of Yards and Booms.

Length when the length is 3.71 the breadth.	Dimensions of Ship.	FIRST EXAMPLE.																	
		MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.									
	Length on Deck when the length is 3.85 the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Main-try-sail-gaff.	Try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
102.0	100	54.0	42.3	27.3	19.1	48.6	38.1	24.6	17.2	42.3	27.4	18.8	13.1	37.0	27.8	16.7	8.3	32.4	38.1
103.0	101	54.5	42.7	27.6	19.3	49.1	38.5	24.9	17.4	42.7	27.8	18.9	13.3	37.4	28.2	16.9	8.4	32.7	38.5
104.0	102	55.1	43.2	27.9	19.4	49.6	38.9	25.1	17.6	43.2	28.1	19.1	13.4	37.7	28.4	17.1	8.5	33.0	38.9
105.0	103	55.6	43.6	28.2	19.6	50.0	39.2	25.3	17.7	43.6	28.3	19.3	13.5	38.1	28.7	17.2	8.6	33.4	39.2
106.0	104	56.2	44.0	28.4	19.8	50.5	39.6	25.6	17.9	44.0	28.6	19.5	13.7	38.5	29.0	17.4	8.7	33.7	39.6
107.0	105	56.7	44.4	28.6	20.0	51.0	40.0	25.8	18.1	44.4	28.9	19.6	13.8	38.8	29.3	17.6	8.8	34.0	40.0
108.0	106	57.2	44.9	28.9	20.2	51.5	40.4	26.1	18.3	44.9	29.2	19.8	13.9	39.2	29.6	17.7	8.8	34.3	40.4
109.0	107	57.8	45.3	29.2	20.4	52.0	40.8	26.3	18.4	45.3	29.4	20.0	14.0	39.6	29.8	17.9	8.9	34.7	40.8
110.0	108	58.3	45.7	29.5	20.6	52.5	41.1	26.5	18.6	45.7	29.7	20.2	14.2	40.0	30.1	18.1	9.0	35.0	41.1
111.0	109	58.9	46.1	29.7	20.8	53.0	41.5	26.8	18.8	46.1	30.0	20.4	14.3	40.3	30.4	18.2	9.1	35.3	41.5
112.0	110	59.4	46.6	30.0	20.9	53.5	41.9	27.1	18.9	46.6	30.3	20.6	14.4	40.7	30.7	18.4	9.2	35.6	41.9
113.0	111	59.9	47.0	30.3	21.1	53.9	42.3	27.3	19.1	47.0	30.5	20.8	14.6	41.1	31.0	18.6	9.3	36.0	42.3
114.0	112	60.5	47.4	30.6	21.3	54.4	42.7	27.6	19.3	47.4	30.8	20.9	14.7	41.4	31.2	18.7	9.3	36.3	42.7
115.0	113	61.0	47.8	30.8	21.5	54.9	43.0	27.8	19.4	47.8	31.0	21.1	14.8	41.8	31.5	18.9	9.4	36.6	43.0
116.0	114	61.6	48.2	31.1	21.7	55.4	43.4	28.0	19.6	48.2	31.4	21.3	15.0	42.2	31.8	19.1	9.5	36.9	43.4
117.0	115	62.1	48.7	31.4	21.9	55.9	43.8	28.3	19.8	48.7	31.6	21.5	15.1	42.5	32.1	19.3	9.6	37.3	43.8
118.0	116	62.6	49.1	31.7	22.1	56.4	44.2	28.5	20.0	49.1	31.9	21.7	15.2	42.9	32.4	19.4	9.7	37.6	44.2
119.0	117	63.2	49.5	31.9	22.3	56.9	44.6	28.8	20.2	49.5	32.2	21.9	15.4	43.3	32.6	19.6	9.8	37.9	44.6
120.0	118	63.7	49.9	32.2	22.5	57.3	45.0	29.0	20.3	49.9	32.5	22.1	15.5	43.7	32.9	19.8	9.9	38.2	45.0
121.0	119	64.3	50.4	32.5	22.7	57.8	45.3	29.3	20.5	50.4	32.7	22.3	15.6	44.0	33.2	19.9	9.9	38.5	45.3
122.0	120	64.8	50.8	32.7	22.9	58.3	45.7	29.5	20.7	50.8	33.0	22.4	15.7	44.4	33.5	20.1	10.0	38.9	45.7
123.0	121	65.3	51.2	33.0	23.1	58.8	46.1	29.8	20.8	51.2	33.3	22.6	15.9	44.8	33.7	20.3	10.1	39.2	46.1
124.0	122	65.9	51.6	33.3	23.2	59.3	46.5	30.0	21.0	51.6	33.6	22.8	16.0	45.1	34.0	20.4	10.2	39.5	46.5
125.0	123	66.4	52.1	33.6	23.4	59.8	46.9	30.3	21.2	52.1	33.8	23.0	16.1	45.5	34.3	20.6	10.3	39.8	46.9
126.0	124	67.0	52.5	33.8	23.6	60.3	47.2	30.5	21.4	52.5	34.1	23.2	16.3	45.9	34.6	20.8	10.4	40.2	47.2
127.0	125	67.5	52.9	34.1	23.8	60.7	47.6	30.8	21.5	52.9	34.4	23.4	16.4	46.2	34.9	20.9	10.4	40.5	47.6
128.0	126	68.0	53.3	34.4	24.0	61.2	48.0	31.0	21.7	53.3	34.7	23.6	16.5	46.6	35.1	21.1	10.5	40.8	48.0
129.0	127	68.6	53.8	34.7	24.2	61.7	48.4	31.2	21.9	53.8	34.9	23.8	16.7	47.0	35.4	21.3	10.6	41.1	48.4
130.0	128	69.1	54.2	34.9	24.4	62.2	48.8	31.5	22.0	54.2	35.2	23.9	16.8	47.4	35.7	21.4	10.7	41.5	48.8
131.0	129	69.7	54.6	35.2	24.6	62.7	49.1	31.7	22.2	54.6	35.5	24.1	16.9	47.7	36.0	21.6	10.8	41.8	49.1
132.0	130	70.2	55.0	35.5	24.8	63.2	49.5	32.0	22.4	55.0	35.8	24.3	17.1	48.1	36.3	21.8	10.8	42.1	49.5

CORVETTES—(*Continued.*)

Lengths of Yards and Booms.

Length when the length is 3.9 the breadth.	Dimensions of Ship.	SECOND EXAMPLE.																
		MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.								
	Length on Deck when the length is 3.85 the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Main try-sail-gaff.	Try-sail gaff.	Swing-boom.
102	100	54.1	38.3	26.8	18.8	47.6	34.5	24.4	17.1	42.1	28.5	18.0	12.6	40.0	31.0	18.6	9.3	32.4
103	101	54.6	38.7	27.1	18.9	48.1	34.8	24.6	17.2	42.5	28.8	18.2	12.7	40.4	31.3	18.8	9.4	32.8
104	102	55.2	39.1	27.3	19.1	48.6	35.2	24.9	17.4	42.9	29.0	18.4	12.8	40.8	31.6	18.9	9.5	33.1
105	103	55.7	39.4	27.6	19.3	49.0	35.5	25.1	17.6	43.4	29.3	18.5	13.0	41.2	31.9	19.1	9.6	33.4
106	104	56.3	39.8	27.9	19.5	49.5	35.9	25.4	17.8	43.8	29.6	18.7	13.1	41.6	32.2	19.3	9.6	33.7
107	105	56.8	40.2	28.1	19.7	50.0	36.2	25.6	17.9	44.2	29.9	18.9	13.2	42.0	32.5	19.5	9.7	34.1
108	106	57.3	40.6	28.4	19.9	50.5	36.5	25.9	18.1	44.6	30.2	19.1	13.3	42.4	32.8	19.7	9.8	34.4
109	107	57.9	41.0	28.7	20.1	50.9	36.9	26.1	18.3	45.0	30.4	19.3	13.5	42.8	33.1	19.9	9.9	34.7
110	108	58.4	41.4	28.9	20.3	51.4	37.2	26.3	18.4	45.5	30.7	19.4	13.6	43.2	33.4	20.0	10.0	35.1
111	109	58.9	41.7	29.2	20.4	51.9	37.6	26.6	18.6	45.9	31.0	19.6	13.7	43.6	33.7	20.2	10.1	35.4
112	110	59.5	42.1	29.5	20.6	52.4	37.9	26.8	18.8	46.3	31.3	19.8	13.8	44.0	34.0	20.4	10.2	35.7
113	111	60.1	42.4	29.8	20.8	52.8	38.2	27.1	18.9	46.7	31.6	20.0	14.0	44.4	34.3	20.6	10.3	36.0
114	112	60.6	42.9	30.0	21.0	53.3	38.6	27.3	19.1	47.1	31.8	20.2	14.1	44.8	34.7	20.8	10.4	36.3
115	113	61.1	43.2	30.3	21.2	53.8	38.9	27.6	19.3	47.5	32.1	20.3	14.2	45.2	35.0	21.0	10.5	36.7
116	114	61.7	43.6	30.6	21.4	54.3	39.3	27.8	19.5	47.9	32.4	20.5	14.3	45.6	35.3	21.2	10.6	37.0
117	115	62.3	44.0	30.8	21.6	54.7	39.6	28.0	19.6	48.4	32.7	20.7	14.5	46.0	35.6	21.3	10.7	37.3
118	116	62.8	44.4	31.1	21.8	55.2	39.9	28.3	19.8	48.8	32.9	20.9	14.6	46.4	35.9	21.5	10.8	37.7
119	117	63.3	44.9	31.4	21.9	55.7	40.3	28.5	20.0	49.2	33.2	21.1	14.7	46.8	36.2	21.7	10.9	38.0
120	118	63.9	45.3	31.6	22.1	56.2	40.6	28.8	20.1	49.7	33.5	21.2	14.9	47.2	36.5	21.9	10.9	38.3
121	119	64.4	45.6	31.9	22.3	56.6	41.0	29.0	20.3	50.1	33.8	21.4	15.0	47.6	36.8	22.1	11.0	38.6
122	120	64.9	46.0	32.2	22.5	57.1	41.3	29.3	20.5	50.5	34.1	21.6	15.1	48.0	37.1	22.3	11.1	38.9
123	121	65.5	46.4	32.4	22.7	57.6	41.6	29.5	20.6	50.9	34.4	21.8	15.2	48.4	37.4	22.5	11.2	39.3
124	122	66.0	46.8	32.7	22.9	58.1	42.0	29.8	20.8	51.3	34.6	22.0	15.4	48.8	37.8	22.6	11.3	39.6
125	123	66.6	47.2	33.0	23.1	58.5	42.3	30.0	21.0	51.8	34.9	22.1	15.5	49.2	38.1	22.8	11.4	39.9
126	124	67.1	47.6	33.2	23.3	59.0	42.7	30.2	21.2	52.2	35.2	22.3	15.6	49.6	38.4	23.0	11.5	40.2
127	125	67.6	47.9	33.5	23.5	59.5	43.0	30.5	21.3	52.6	35.5	22.5	15.7	50.0	38.7	23.2	11.6	40.6
128	126	68.2	48.3	33.8	23.6	60.0	43.3	30.7	21.5	53.0	35.8	22.7	15.9	50.4	39.0	23.4	11.7	40.9
129	127	68.7	48.7	34.0	23.8	60.5	43.7	31.0	21.7	53.4	36.0	22.8	16.1	50.8	39.3	23.6	11.8	41.2
130	128	69.3	49.0	34.3	24.0	60.9	44.0	31.2	21.8	53.9	36.3	23.0	16.2	51.2	39.6	23.8	11.9	41.5
131	129	69.8	49.5	34.6	24.2	61.4	44.4	31.5	22.0	54.3	36.6	23.2	16.3	51.6	39.9	23.9	12.0	41.9
132	130	70.3	49.8	34.8	24.4	61.9	44.7	31.7	22.2	54.7	36.9	23.4	16.4	52.0	40.2	24.1	12.1	42.2

CORVETTES.—*Lengths of Yards and Booms.*

Dimensions of Ship.	SWEDISH CORVETTES.														YACHT RIGGED AS SHIP.																	
	MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.				Driver-boom.	Gaff.	MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.				Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
Length on Deck.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top sail.	Top-gallant.	Royal.			Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross jack.	Top-sail.	Top-gallant.	Royal.						
95	53.1	38.8	25.3	17.7	47.6	34.1	22.4	15.7	38.8	27.7	17.6	12.3	38.0	22.6	51.6	38.7	24.0	16.8	46.4	34.8	21.6	15.1	38.7	27.1	16.8	11.7	38.0	27.4	8.2	16.4	30.9	34.8
96	53.7	39.3	25.6	17.9	48.1	34.5	22.7	15.9	39.3	28.0	17.8	12.4	38.4	22.8	52.1	39.1	24.2	17.0	46.9	35.2	21.8	15.3	39.1	27.4	17.0	11.9	38.4	27.6	8.3	16.6	31.3	35.2
97	54.2	39.7	25.9	18.1	48.6	34.8	22.9	16.0	39.7	28.3	18.0	12.6	38.8	23.1	52.7	39.5	24.5	17.1	47.4	35.5	22.0	15.4	39.5	27.6	17.1	12.0	38.8	27.9	8.4	16.8	31.6	35.5
98	54.8	40.1	26.1	18.3	49.1	35.2	23.2	16.2	40.1	28.6	18.1	12.7	39.2	23.3	53.2	39.9	24.7	17.3	47.9	35.9	22.3	15.6	39.9	27.9	17.3	12.1	39.2	28.2	8.5	17.0	31.9	35.9
99	55.3	40.5	26.4	18.5	49.6	35.5	23.4	16.4	40.5	28.9	18.3	12.8	39.6	23.6	53.7	40.3	25.0	17.5	48.4	36.3	22.5	15.7	40.3	28.2	17.5	12.2	39.6	28.5	8.6	17.1	32.2	36.3
100	55.9	40.9	26.7	18.7	50.1	35.9	23.6	16.5	40.9	29.2	18.5	13.0	40.0	23.8	54.3	40.7	25.2	17.7	48.9	36.6	22.7	15.9	40.7	28.5	17.7	12.4	40.0	28.8	8.6	17.3	32.6	36.6
101	56.4	41.3	26.9	18.8	50.6	36.3	23.9	16.7	41.3	29.4	18.7	13.1	40.4	24.0	54.8	41.1	25.5	17.8	49.3	37.0	22.9	16.1	41.1	28.8	17.8	12.5	40.4	29.1	8.7	17.5	32.9	37.0
102	57.0	41.7	27.2	19.0	51.1	36.6	24.1	16.9	41.7	29.7	18.9	13.2	40.8	24.3	55.4	41.5	25.7	18.0	49.8	37.4	23.2	16.2	41.5	29.1	18.0	12.6	40.8	29.4	8.8	17.6	33.2	37.4
103	57.6	42.1	27.5	19.2	51.6	36.9	24.3	17.0	42.1	30.0	19.1	13.4	41.2	24.5	55.9	41.9	26.0	18.2	50.3	37.7	23.4	16.4	41.9	29.4	18.2	12.7	41.2	29.7	8.9	17.8	33.5	37.7
104	58.1	42.5	27.7	19.4	52.1	37.3	24.6	17.2	42.5	30.6	19.3	13.5	41.6	24.7	56.5	42.3	26.2	18.4	50.8	38.1	23.6	16.5	42.3	29.6	18.4	12.9	41.6	29.9	8.9	18.0	33.9	38.1
105	58.7	43.0	28.0	19.6	52.6	37.7	24.8	17.4	43.0	30.9	19.4	13.6	42.0	25.0	57.0	42.7	26.5	18.5	51.3	38.5	23.9	16.7	42.7	29.9	18.5	13.0	42.0	30.2	9.1	18.1	34.2	38.5
106	59.2	43.4	28.3	19.8	53.1	38.1	25.0	17.5	43.4	30.2	19.6	13.7	42.4	25.2	57.5	43.2	26.8	18.7	51.8	38.8	24.1	16.9	43.2	30.2	18.7	13.1	42.4	30.5	9.2	18.3	34.5	38.8
107	59.8	43.8	28.5	20.0	53.6	38.4	25.3	17.7	43.8	31.3	19.8	13.9	42.8	25.5	58.1	43.6	27.0	18.9	52.3	39.2	24.3	17.2	43.6	30.5	18.9	13.2	42.8	30.8	9.2	18.4	34.8	39.2
108	60.4	44.2	28.8	20.1	54.1	38.7	25.5	17.9	44.2	31.5	20.0	14.0	43.2	25.7	58.6	44.0	27.3	19.1	52.8	39.6	24.5	17.3	44.0	30.8	19.1	13.4	43.2	31.1	9.3	18.6	35.2	39.6
109	60.9	44.6	29.1	20.3	54.6	39.1	25.8	18.0	44.6	31.8	20.2	14.1	43.6	25.9	59.2	44.4	27.5	19.3	53.3	39.9	24.8	17.5	44.4	31.1	19.3	13.5	43.6	31.4	9.4	18.8	35.5	39.9
110	61.4	44.9	29.3	20.5	55.1	39.5	26.0	18.1	44.9	32.1	20.4	14.3	44.0	26.2	59.7	44.8	27.8	19.4	53.7	40.3	25.0	17.6	44.8	31.3	19.4	13.6	44.0	31.7	9.5	19.0	35.8	40.3
111	62.0	45.4	29.6	20.7	55.6	39.9	26.2	18.4	45.4	32.4	20.6	14.4	44.4	26.4	60.3	45.2	28.0	19.6	54.2	40.7	25.2	17.8	45.2	31.6	19.6	13.7	44.4	32.0	9.6	19.1	36.2	40.7
112	62.6	45.8	29.9	20.9	56.1	40.2	26.5	18.5	45.8	32.6	20.7	14.5	44.8	26.6	60.8	45.6	28.3	19.8	54.7	41.0	25.5	17.9	45.6	31.9	19.8	13.8	44.8	32.2	9.7	19.3	36.5	41.0
113	63.2	46.2	30.1	21.1	56.6	40.6	26.7	18.7	46.2	32.9	20.9	14.6	45.2	26.9	61.3	46.0	28.5	20.0	55.2	41.4	25.7	18.0	46.0	32.2	20.0	14.0	45.2	32.5	9.8	19.5	36.8	41.4
114	63.7	46.6	30.4	21.3	57.1	40.9	26.9	18.9	46.6	33.2	21.1	14.8	45.6	27.1	61.9	46.4	28.7	20.2	55.7	41.8	25.8	18.1	46.4	32.5	20.2	14.1	45.6	32.8	9.8	19.7	37.1	41.8
115	64.3	47.0	30.7	21.5	57.6	41.3	27.2	19.0	47.0	33.5	21.3	14.9	46.0	27.4	62.4	46.8	28.9	20.3	56.2	42.1	26.1	18.2	46.8	32.8	20.3	14.2	46.0	33.1	9.9	19.8	37.5	42.1
116	64.8	47.5	30.9	21.6	58.1	41.6	27.4	19.2	47.5	33.8	21.5	15.0	46.4	27.6	63.0	47.2	29.2	20.5	56.7	42.5	26.3	18.4	47.2	33.0	20.5	14.3	46.4	33.4	10.0	20.0	37.8	42.5
117	65.4	47.9	31.2	21.8	58.6	42.0	27.6	19.3	47.9	34.1	21.7	15.2	46.8	27.8	63.5	47.6	29.4	20.7	57.2	42.9	26.6	18.6	47.6	33.3	20.7	14.5	46.8	33.7	10.1	20.2	38.1	42.9
118	66.0	48.3	31.5	22.0	59.1	42.4	27.9	19.5	48.3	34.4	21.9	15.3	47.2	28.1	64.1	48.1	29.7	20.9	57.6	43.2	26.8	18.8	48.1	33.6	20.9	14.6	47.2	34.0	10.2	20.3	38.4	43.2
119	66.5	48.7	31.7	22.2	59.6	42.7	28.1	19.7	48.7	34.7	22.0	15.4	47.6	28.3	64.6	48.5	29.9	21.1	58.1	43.6	27.0	18.9	48.5	33.9	21.1	14.7	47.6	34.3	10.3	20.5	38.8	43.6
120	67.1	49.1	32.0	22.4	60.1	43.1	28.4	19.8	49.1	35.0	22.2	15.5	48.0	28.6	65.2	48.9	30.2	21.2	58.6	44.0	27.3	19.1	48.9	34.2	21.2	14.8	48.0	34.6	10.4	20.7	39.1	44.0

FRIGATES.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib, and Flying Jib-booms.

Dimensions of Ship.	LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.*
	Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
1st Exam.																					
30.0	58.2	11.2	53.0	10.2	45.0	7.7	35.9	5.7	31.4	4.9	26.6	4.1	18.3	13.7	16.5	12.3	13.7	10.3	42.4	31.0	34.2
30.5	59.2	11.4	53.8	10.4	45.7	7.8	36.4	5.8	31.9	5.0	27.0	4.2	18.6	13.9	16.7	12.5	13.9	10.5	43.1	31.6	34.7
31.0	60.1	11.6	54.7	10.6	46.5	7.9	36.9	5.9	32.4	5.1	27.4	4.3	18.9	14.2	17.0	12.8	14.2	10.6	43.8	32.1	35.3
31.5	61.1	11.8	55.6	10.7	47.2	8.1	37.4	6.0	33.0	5.1	27.9	4.3	19.2	14.4	17.3	13.0	14.4	10.8	44.5	32.6	35.9
32.0	62.1	12.0	56.5	10.9	48.0	8.2	37.9	6.1	33.5	5.2	28.3	4.4	19.5	14.6	17.6	13.2	14.6	11.0	45.2	33.1	36.4
32.5	63.0	12.2	57.4	11.1	48.7	8.3	38.5	6.2	34.0	5.3	28.8	4.5	19.8	14.9	17.8	13.4	14.9	11.1	45.9	33.6	37.0
33.0	64.0	12.4	58.2	11.3	49.5	8.4	39.1	6.3	34.5	5.4	29.2	4.6	20.1	15.1	18.1	13.6	15.1	11.3	46.6	34.2	37.6
33.5	65.0	12.6	59.1	11.4	50.2	8.5	39.7	6.4	35.0	5.5	29.7	4.6	20.4	15.3	18.4	13.8	15.3	11.5	47.3	34.7	38.1
34.0	66.0	12.7	60.0	11.6	51.0	8.7	40.2	6.4	35.6	5.5	30.1	4.7	20.7	15.5	18.6	14.0	15.5	11.7	48.0	35.2	38.7
34.5	66.9	12.9	60.9	11.8	51.7	8.8	40.8	6.5	36.1	5.6	30.5	4.8	21.0	15.8	18.9	14.2	15.8	11.8	48.7	35.7	39.3
35.0	67.9	13.1	61.8	11.9	52.5	8.9	41.4	6.6	36.6	5.7	31.0	4.8	21.3	16.0	19.2	14.4	16.0	12.0	49.4	36.2	39.8
35.5	68.9	13.3	62.7	12.1	53.2	9.0	42.0	6.7	37.1	5.8	31.4	4.9	21.6	16.2	19.5	14.6	16.2	12.2	50.1	36.7	40.4
36.0	69.8	13.5	63.5	12.3	54.0	9.1	42.5	6.7	37.7	5.9	31.9	5.0	21.9	16.5	19.7	14.8	16.5	12.3	50.8	37.3	41.0
2nd Exam.																					
30.0	60.5	11.7	55.1	10.6	47.1	8.6	38.7	6.0	34.5	5.4	28.5	4.4	19.7	14.5	18.1	13.3	14.8	10.9	45.3	32.2	32.8
30.5	61.5	11.9	56.0	10.8	47.9	8.7	39.3	6.1	35.1	5.5	29.0	4.5	20.0	14.7	18.4	13.5	15.0	11.0	46.1	32.7	33.4
31.0	62.5	12.1	56.9	11.0	48.7	8.8	40.0	6.2	35.7	5.6	29.5	4.6	20.4	15.0	18.7	13.8	15.3	11.2	46.8	33.2	33.9
31.5	63.6	12.3	57.8	11.2	49.4	9.0	40.6	6.3	36.3	5.7	29.9	4.7	20.7	15.2	19.0	14.0	15.5	11.4	47.6	33.8	34.5
32.0	64.6	12.5	58.8	11.3	50.2	9.1	41.3	6.4	36.9	5.7	30.4	4.7	21.0	15.4	19.3	14.2	15.8	11.6	48.3	34.3	35.0
32.5	65.6	12.7	59.7	11.5	51.0	9.2	41.9	6.5	37.4	5.8	30.9	4.8	21.3	15.7	19.6	14.4	16.0	11.8	49.1	34.9	35.6
33.0	66.6	12.9	60.6	11.7	51.8	9.3	42.6	6.6	38.0	5.9	31.4	4.9	21.7	15.9	19.9	14.7	16.3	11.9	49.9	35.4	36.1
33.5	67.6	13.1	61.6	11.9	52.5	9.4	43.2	6.7	38.6	6.0	31.8	5.0	22.0	16.2	20.2	14.9	16.5	12.1	50.6	35.9	36.6
34.0	68.7	13.3	62.5	12.1	53.3	9.5	43.9	6.8	39.2	6.1	32.3	5.0	22.3	16.4	20.5	15.1	16.7	12.3	51.4	36.5	37.2
34.5	69.7	13.5	63.4	12.3	54.1	9.6	44.5	6.9	39.7	6.2	32.8	5.1	22.7	16.6	20.8	15.3	17.0	12.5	52.1	37.0	37.7
35.0	70.7	13.7	64.5	12.4	54.9	9.7	45.1	7.0	40.3	6.3	33.3	5.2	23.0	16.9	21.1	15.5	17.2	12.7	52.9	37.5	38.3
35.5	71.7	13.9	65.3	12.6	55.6	9.8	45.8	7.1	40.9	6.4	33.7	5.2	23.3	17.1	21.4	15.8	17.5	12.8	53.6	38.1	38.8
36.0	72.8	14.1	66.2	12.8	56.3	9.9	46.4	7.2	41.5	6.5	34.2	5.3	23.6	17.4	21.7	16.0	17.7	13.0	54.4	38.6	39.4

FRIGATES—(*Continued.*)

Lengths of Yards and Booms.

FIRST EXAMPLE.

Dimensions of Ship.	MAIN-YARD.				FORE-YARD.				MIZEN-YARD.									
Length.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
112	61.9	45.8	28.0	19.6	54.1	40.3	24.6	17.2	45.8	30.5	21.3	14.9	44.2	33.6	11.1	22.2	37.2	40.3
113	62.5	46.2	28.2	19.7	54.5	40.6	24.9	17.4	46.2	30.7	21.4	15.0	44.6	33.9	11.2	22.4	37.5	40.6
114	63.0	46.6	28.4	19.8	55.0	41.0	25.0	17.5	46.6	31.0	21.6	15.2	45.0	34.2	11.3	22.6	37.8	41.0
115	63.6	47.1	28.7	20.1	55.5	41.4	25.3	17.7	47.1	31.3	21.8	15.3	45.4	34.5	11.4	22.8	38.1	41.4
116	64.1	47.5	29.0	20.3	56.0	41.8	25.5	17.8	47.5	31.6	22.0	15.4	45.8	34.8	11.5	23.0	38.5	41.8
117	64.7	47.9	29.2	20.5	56.5	42.1	25.7	18.0	47.9	31.8	22.2	15.6	46.2	35.1	11.6	23.2	38.8	42.1
118	65.2	48.3	29.5	20.6	57.0	42.4	26.0	18.2	48.3	32.1	22.4	15.7	46.6	35.4	11.7	23.4	39.1	42.4
119	65.8	48.7	29.7	20.8	57.4	42.8	26.2	18.3	48.7	32.4	22.6	15.8	47.0	35.7	11.8	23.6	39.5	42.8
120	66.4	49.1	30.0	21.0	57.9	43.2	26.4	18.5	49.1	32.6	22.8	16.0	47.4	36.0	11.9	23.8	39.8	43.2
121	66.9	49.5	30.2	21.2	58.4	43.5	26.6	18.6	49.5	32.9	22.9	16.1	47.8	36.3	12.0	24.0	40.1	43.5
122	67.5	49.9	30.5	21.3	59.0	43.9	26.8	18.8	49.9	33.2	23.2	16.2	48.2	36.6	12.1	24.2	40.5	43.9

SECOND EXAMPLE.

Dimensions of Ship.		MAIN-YARD.				FORE-YARD.				MIZEN-YARD.									
Length of Deck when length is 3.9 breadth.	Length.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
129	120	70.8	54.0	34.6	23.8	62.6	48.3	30.1	21.2	54.0	35.4	24.3	17.0	47.7	34.3	10.3	20.6	42.2	48.3
130	121	71.4	54.3	34.8	24.0	63.1	48.7	30.8	21.5	54.3	35.7	24.5	17.1	48.1	34.6	10.4	20.8	42.5	48.7
131	122	72.0	54.8	35.0	24.2	63.6	49.1	31.1	21.8	54.8	36.0	24.8	17.3	48.5	34.9	10.5	21.0	42.8	49.1
132	123	72.6	55.1	35.3	24.5	64.2	49.4	31.4	22.0	55.1	36.3	25.2	17.6	48.9	35.2	10.6	21.2	43.2	49.4
133	124	73.2	55.5	35.6	24.7	64.7	49.8	31.7	22.2	55.5	36.6	25.5	17.8	49.3	35.5	10.6	21.2	43.5	49.8
134	125	73.7	55.9	36.0	24.9	65.2	50.1	32.0	22.4	55.9	36.9	25.8	18.0	49.7	35.8	10.7	21.4	43.9	50.1
135	126	74.3	56.4	36.3	25.1	65.7	50.5	32.3	22.6	56.4	37.2	26.0	18.2	50.1	36.1	10.8	21.6	44.2	50.5
136	127	74.9	56.8	36.7	25.4	66.2	50.9	32.6	22.8	56.8	37.4	26.3	18.4	50.5	36.4	10.9	21.8	44.6	50.9
137	128	75.5	57.2	37.0	25.6	66.7	51.2	32.9	23.0	57.2	37.7	26.6	18.6	50.9	36.7	11.0	22.0	44.9	51.2
138	129	76.1	57.7	37.4	25.9	67.2	51.6	33.3	23.2	57.7	38.0	26.8	18.7	51.3	37.0	11.1	22.2	45.3	51.6
139	130	76.7	58.1	37.8	26.1	68.3	52.0	33.6	23.5	58.1	38.3	27.1	18.9	51.7	37.3	11.2	22.4	45.7	52.0
140	131	77.3	58.6	38.1	26.3	68.8	52.3	33.9	23.7	58.6	38.6	27.4	19.1	52.1	37.6	11.3	22.6	46.0	52.3
141	132	77.9	59.0	38.5	26.6	69.3	52.7	34.2	23.9	59.0	38.9	27.7	19.3	52.5	37.9	11.4	22.8	46.4	52.7
142	133	78.5	59.5	38.8	26.9	69.8	53.1	34.5	24.1	59.5	39.2	27.9	19.5	52.9	38.2	11.5	23.0	46.7	53.1
143	134	79.1	59.9	39.2	27.2	70.3	53.5	34.8	24.3	59.9	40.0	28.2	19.7	53.3	38.5	11.5	23.0	47.1	53.4
144	135	79.6	60.3	39.5	27.6	70.8	53.8	35.2	24.6	60.3	40.3	28.7	20.0	53.7	38.8	11.6	23.2	47.4	53.8

FRIGATES (*Continued.*)—*Lengths of Yards, Booms, &c.*

THIRD EXAMPLE.

Dimensions of Ship.	MAIN-YARD.				FORE-YARD.				MIZEN-YARD.				Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
Length	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.						
135	72.9	52.4	33.5	23.1	63.9	47.8	29.5	20.6	52.4	35.9	25.6	17.9	49.5	37.6	11.3	22.6	43.7	49.6
136	73.4	52.8	33.7	23.3	64.3	48.1	29.7	20.7	52.8	36.2	25.7	18.0	49.9	37.9	11.4	22.7	44.1	49.9
137	74.0	53.2	34.0	23.4	64.8	48.4	29.9	20.8	53.2	36.5	25.9	18.1	50.3	38.2	11.4	22.9	44.4	50.3
138	74.5	53.5	34.2	23.6	65.3	48.7	30.2	21.0	53.5	36.8	26.0	18.2	50.6	38.4	11.5	23.1	44.7	50.7
139	75.1	54.0	34.5	23.8	65.7	49.0	30.4	21.2	54.0	37.1	26.2	18.3	51.0	38.7	11.6	23.2	45.0	51.0
140	75.6	54.3	34.7	24.0	66.2	49.3	30.6	21.4	54.3	37.4	26.4	18.4	51.4	39.0	11.7	23.4	45.4	51.4
141	76.1	54.7	35.0	24.1	66.7	49.6	30.8	21.5	54.7	37.7	26.5	18.6	51.7	39.3	11.8	23.6	45.7	51.8
142	76.7	55.1	35.2	24.3	67.2	49.9	31.0	21.7	55.1	38.0	26.7	18.7	52.1	39.5	11.9	23.7	46.0	52.1
143	77.2	55.5	35.5	24.5	67.6	50.3	31.2	21.8	55.5	38.3	26.8	18.8	52.5	39.8	11.9	23.9	46.3	52.5
144	77.8	55.9	35.7	24.6	68.1	50.7	31.4	22.0	55.9	38.6	27.0	18.9	52.8	40.1	12.0	24.1	46.6	52.9
145	78.3	56.3	36.0	24.8	68.6	51.0	31.6	22.1	56.3	38.9	27.2	19.0	53.2	40.4	12.1	24.2	47.0	53.2
146	78.8	56.7	36.2	25.0	69.1	51.4	31.9	22.3	56.7	39.1	27.3	19.1	53.6	40.7	12.2	24.4	47.3	53.6
147	79.4	57.1	36.4	25.2	69.5	51.8	32.1	22.4	57.1	39.5	27.5	19.2	53.9	40.9	12.3	24.6	47.6	54.0
148	79.9	57.5	36.7	25.3	70.0	52.1	32.2	22.6	57.5	39.8	27.6	19.3	54.3	41.2	12.4	24.7	47.9	54.3
149	80.5	57.8	36.9	25.5	70.5	52.5	32.5	22.7	57.8	40.1	27.8	19.4	54.6	41.5	12.4	24.9	48.3	54.7
150	81.0	58.2	37.2	25.7	70.9	52.9	32.7	22.9	58.2	40.5	27.9	19.5	55.0	41.8	12.5	25.1	48.6	55.1
151	81.5	58.6	37.4	25.8	71.4	53.2	32.9	23.0	58.6	40.8	28.1	19.6	55.4	42.1	12.6	25.2	48.9	55.5
152	82.1	59.0	37.7	26.0	71.9	53.6	33.1	23.2	59.0	41.1	28.2	19.7	55.8	42.3	12.7	25.4	49.2	55.8
153	82.6	9.3	37.9	26.2	72.4	54.0	33.3	23.4	59.3	41.4	28.4	19.8	56.1	42.6	12.8	25.6	49.6	56.2
154	83.2	59.7	38.1	26.4	72.8	54.3	33.5	23.5	59.1	41.7	28.5	19.9	56.5	42.9	12.9	25.7	49.9	56.6
155	83.7	60.1	38.3	26.5	73.3	54.7	33.7	23.6	60.1	42.0	28.7	20.0	56.9	43.2	12.9	25.9	50.2	56.9

FOURTH EXAMPLE.

Dimensions.		MAIN-YARD.				FORE-YARD.				MIZEN-YARD.				Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
Length of the Deck when the length is 3.5 breadth.	Length of Deck when the length is 3.7 breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.						
152	155	82.1	60.0	40.7	32.6	72.4	52.7	35.8	28.6	60.0	43.8	29.7	23.2	56.6	40.5	12.1	24.3	49.2	52.7
153	156	82.7	60.4	41.0	32.8	72.9	53.0	36.0	28.8	0.4	44.1	29.9	23.3	57.0	40.7	12.2	24.4	49.6	53.0
154	157	83.2	60.8	41.3	33.0	73.4	53.3	36.2	28.9	60.8	44.4	30.1	23.4	57.3	40.9	12.2	24.5	49.9	53.3
155	158	83.7	61.2	41.5	33.2	73.9	53.7	36.5	29.2	61.2	44.7	30.3	23.6	57.7	41.2	12.3	24.7	50.2	53.7
156	159	84.3	61.6	41.8	33.4	74.3	54.0	36.7	29.3	61.6	45.0	30.5	23.7	58.1	41.5	12.4	24.9	50.5	54.0
157	160	84.8	61.9	42.0	33.6	74.8	54.4	36.9	29.5	61.9	45.2	30.7	23.9	58.4	41.8	12.5	25.1	50.8	54.4
158	161	85.3	62.3	42.3	33.9	75.3	54.7	37.2	29.7	62.3	45.5	30.9	24.0	58.8	42.1	12.6	25.2	51.1	54.7
159	162	85.9	62.7	42.6	34.1	75.8	55.1	37.4	29.9	62.7	45.7	31.1	24.2	59.2	42.3	12.6	25.3	51.4	55.1
1 0	163	86.3	63.1	42.8	4.3	76.2	55.4	37.6	30.1	63.1	45.9	31.3	24.3	59.5	42.6	12.7	25.5	51.7	55.4
161	164	86.9	63.5	43.1	34.5	76.7	55.7	37.8	30.2	63.5	46.2	31.5	24.5	59.9	42.8	12.8	25.6	52.1	55.7
162	165	87.4	63.9	43.4	34.7	77.1	56.1	38.1	30.4	63.9	46.5	31.7	24.6	60.2	43.1	12.9	25.8	52.4	56.1
163	166	88.0	64.2	43.6	34.9	77.6	56.5	38.3	30.6	64.2	46.8	31.9	24.8	60.6	43.4	13.0	26.0	52.8	56.5
164	167	88.5	64.6	43.9	35.1	78.1	56.8	38.5	30.8	64.6	47.1	32.1	24.9	60.9	43.6	13.0	26.1	53.1	56.8
65	168	89.0	65.0	44.1	35.3	78.6	7.1	38.8	31.0	65.0	47.4	32.3	25.1	61.3	43.9	13.1	26.3	53.4	57.1
166	169	89.6	65.4	44.4	5.5	79.0	57.4	39.0	31.2	65.4	47.6	32.4	25.2	61.6	44.1	13.2	26.4	53.7	57.4
167	170	90.1	65.8	44.6	35.7	79.5	57.7	39.2	31.4	65.8	47.9	32.6	25.4	62.0	44.4	13.3	26.6	54.0	57.7
168	171	90.6	66.2	44.9	35.9	80.0	58.1	39.5	31.6	66.2	48.2	32.8	25.5	62.4	44.6	13.3	26.7	54.3	58.1
169	172	91.2	66.6	45.2	36.1	80.4	58.5	39.7	31.8	66.6	48.5	33.0	25.7	62.8	44.9	13.4	26.9	54.7	58.5
170	173	91.7	66.9	45.5	36.4	80.9	58.8	39.9	31.9	66.9	48.8	33.2	25.8	63.1	45.2	13.5	27.1	55.0	58.8
171	174	92.2	67.3	45.7	36.6	81.3	59.1	40.1	32.1	67.3	49.1	33.4	26.0	63.5	45.4	13.6	7.2	55.3	59.1
172	175	92.7	67.7	46.0	36.8	81.8	59.5	40.4	32.3	67.7	49.4	33.6	26.1	63.8	45.7	13.7	27.4	55.6	59.5
173	176	93.3	68.1	46.2	37.0	82.3	59.8	40.6	32.5	68.1	49.7	33.8	26.3	64.2	46.0	13.8	27.6	55.9	59.8
174	177	93.8	68.5	46.5	37.2	82.8	60.1	40.9	32.7	68.5	49.9	34.0	26.4	64.6	46.2	13.8	27.7	56.2	60.1
175	178	94.3	68.8	46.8	37.4	83.2	60.5	41.1	32.9	68.8	50.2	34.2	26.6	65.0	46.5	13.9	27.9	56.5	60.5
176	179	94.8	69.2	47.0	37.6	83.6	60.8	41.3	33.1	69.2	50.5	34.4	26.7	65.3	46.7	14.0	28.0	56.8	60.8
177	180	95.2	69.5	47.2	37.8	84.0	61.1	41.6	33.3	69.5	50.8	34.6	26.8	65.7	47.0	14.1	28.2	57.1	61.1

FRIGATES—(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib, and Flying Jib-booms.

Dimensions of Ship.		THIRD EXAMPLE.																				
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
Breadth when .3 the length.	Breadth when .27 the length.	Hounded	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
40.0	36.0	69.8	13.5	64.0	12.4	51.0	8.8	41.8	6.5	37.6	5.9	31.5	4.9	21.6	16.2	19.4	14.6	16.2	12.1	49.0	35.5	42.6
40.5	36.5	70.8	13.7	64.9	12.5	51.7	8.9	42.3	6.6	38.1	5.9	32.0	5.0	21.9	16.4	19.7	14.8	16.4	12.3	49.7	36.0	43.2
41.0	37.0	71.7	13.9	65.8	12.7	52.4	9.1	42.9	6.7	38.6	6.0	32.4	5.0	22.2	16.6	20.0	15.0	16.6	12.5	50.4	36.5	43.8
41.5	37.5	72.7	14.0	66.7	12.9	53.1	9.2	43.5	6.8	39.1	6.1	32.8	5.1	22.5	16.9	20.2	15.2	16.9	12.6	51.1	37.0	44.4
42.0	38.0	73.7	14.2	67.6	13.1	53.8	9.3	44.1	6.9	39.7	6.2	33.3	5.2	22.8	17.1	20.5	15.4	17.1	12.8	51.8	37.5	45.0
42.5	38.5	74.7	14.4	68.5	13.2	54.5	9.4	44.7	7.0	40.2	6.3	33.7	5.3	23.1	17.3	20.8	15.6	17.3	13.0	52.4	38.0	45.6
43.0	39.0	75.7	14.6	69.4	13.4	55.2	9.5	45.2	7.0	40.7	6.3	34.1	5.3	23.4	17.5	21.1	15.8	17.5	13.2	53.1	38.5	46.2
43.5	39.5	76.7	14.8	70.3	13.6	55.9	9.7	45.8	7.1	41.2	6.4	34.6	5.4	23.7	17.8	21.3	16.0	17.8	13.3	53.8	39.0	46.8
44.0	40.0	77.7	15.0	71.1	13.7	56.6	9.8	46.4	7.2	41.8	6.5	35.0	5.5	24.0	18.0	21.6	16.2	18.0	13.5	54.5	39.5	47.4
44.5	40.5	78.6	15.2	72.0	13.9	57.3	9.9	47.0	7.3	42.3	6.6	35.5	5.5	24.3	18.2	21.9	16.4	18.2	13.7	55.2	40.0	48.0
45.0	41.0	79.5	15.3	72.9	14.1	58.1	10.0	47.6	7.4	42.8	6.7	35.9	5.6	24.6	18.4	22.1	16.6	18.4	13.8	55.9	40.5	48.6
45.5	41.5	80.5	15.5	73.8	14.3	58.8	10.1	48.1	7.5	43.3	6.8	36.0	5.7	24.9	18.7	22.4	16.8	18.7	14.0	56.5	41.0	49.2
46.0	42.0	81.5	15.7	74.7	14.4	59.5	10.3	48.7	7.6	43.8	6.8	36.8	5.7	25.2	18.9	22.7	17.0	18.9	14.2	57.2	41.5	49.8
46.5	42.5	82.4	15.9	75.6	14.6	60.2	10.4	49.3	7.7	44.4	6.9	37.2	5.8	25.5	19.1	22.9	17.2	19.1	14.3	57.9	42.0	50.4
47.0	43.0	83.4	16.1	76.5	14.8	60.9	10.5	49.9	7.8	44.9	7.0	37.6	5.9	25.8	19.3	23.2	17.4	19.3	14.5	58.6	42.5	51.0
47.5	43.5	84.4	16.3	77.4	14.9	61.6	10.6	50.5	7.9	45.4	7.1	38.1	5.9	26.1	19.6	23.5	17.6	19.6	14.7	59.3	43.0	51.6
48.0	44.0	85.4	16.5	78.3	15.1	62.3	10.8	51.0	8.0	45.9	7.2	38.5	6.0	26.4	19.8	23.8	17.8	19.8	14.8	59.9	43.4	52.1
48.5	44.5	86.3	16.7	79.2	15.3	63.0	10.9	51.6	8.0	46,4	7.2	39.0	6.1	26.7	20.0	24.0	18.0	20.0	15.0	60.6	43.9	52.7
49.0	45.0	87.3	16.8	80.0	15.5	63.7	11.0	52.2	8.1	47.0	7.3	39.4	6.1	27.6	20.2	24.3	18.2	20.2	15.2	61.3	44.4	53.3
49.5	45.5	88.3	17.0	80.9	15.6	64.4	11.1	52.8	8.2	47.5	7.4	39.8	6.2	27.3	20.5	24.6	18.4	20.5	15.3	62.0	44.9	53.9
50.0	46.0	89.2	17.2	81.8	15.8	65.1	11.3	53.4	8.3	48.0	7.5	40.3	6.3	27.6	20.7	24.8	18.6	20.7	15.5	62.7	45.4	54.5
50.5	46.5	90.2	17.4	82.7	16.0	65.8	11.4	53.9	8.4	48.5	7.6	40.7	6.4	27.9	20.9	25.1	18.8	20.5	15.7	63.3	45.9	55.1
51.0	47.0	91.2	17.6	83.6	16.2	66.6	11.5	54.5	8.5	49.1	7.6	41.2	6.4	28.2	21.1	25.4	19.0	21.1	15.9	64.0	46.4	55.7

FRIGATES—(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Dimensions of Ship.		FOURTH EXAMPLE.																				
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.								
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main		Fore.		Mizen.				
Breadth when .31 the length.	Breadth when .27 the length.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.	Bowsprit.	Jib-boom.	Flying-jib-boom.
37.5	36.0	70.2	13.6	64.6	12.8	51.7	8.9	41.1	6.4	37.0	5.8	30.0	4.5	20.5	16.4	18.5	14.8	15.2	12.1	48.2	35.2	42.3
38.0	36.5	71.2	13.7	65.5	13.0	52.4	9.1	41.6	6.5	37.5	5.8	30.4	4.5	20.8	16.6	18.7	15.0	15.4	12.3	48.9	35.7	42.8
38.5	37.0	72.1	13.9	66.4	13.2	53.2	9.2	42.2	6.6	37.9	5.9	30.8	4.6	21.1	16.9	19.0	15.2	15.6	12.5	49.6	36.2	43.4
39.0	37.5	73.1	14.1	67.3	13.4	53.9	9.3	42.7	6.7	38.4	6.0	31.2	4.7	21.4	17.1	19.2	15.4	15.8	12.6	50.3	36.7	44.0
39.5	38.0	74.1	14.3	68.2	13.5	54.6	9.5	43.3	6.7	38.9	6.1	31.6	4.7	21.7	17.3	19.5	15.6	16.0	12.8	51.0	37.2	44.6
40.0	38.5	75.1	14.5	69.1	13.7	55.3	9.6	43.8	6.8	39.4	6.1	32.0	4.8	21.9	17.5	19.7	15.8	16.2	13.0	51.7	37.7	45.2
40.5	39.0	76.0	14.7	70.0	13.9	56.0	9.7	44.4	6.9	39.9	6.2	32.4	4.9	22.2	17.8	20.0	16.0	16.4	13.2	52.3	38.2	45.8
41.0	39.5	77.0	14.9	70.9	14.1	56.8	9.9	44.9	7.0	40.4	6.3	32.8	4.9	22.5	18.0	20.3	16.2	16.7	13.3	53.0	38.7	46.4
41.5	40.0	78.0	15.1	71.8	14.3	57.5	10.0	45.5	7.1	40.9	6.4	33.2	5.0	22.8	18.2	20.5	16.4	16.9	13.5	53.7	39.2	47.0
42.0	40.5	79.0	15.3	72.6	14.4	58.2	10.1	46.1	7.2	41.4	6.5	33.6	5.1	23.1	18.5	20.8	16.6	17.1	13.7	54.4	39.6	47.5
42.5	41.0	79.9	15.5	73.5	14.6	58.9	10.3	46.6	7.3	41.9	6.5	34.0	5.2	23.4	18.7	21.0	16.8	17.3	13.8	55.1	40.1	48.1
43.0	41.5	80.9	15.6	74.4	14.8	59.6	10.4	47.2	7.3	42.4	6.6	34.4	5.2	23.6	18.9	21.3	17.0	17.5	14.0	55.8	40.6	48.7
43.5	42.0	81.9	15.8	75.3	15.0	60.4	10.5	47.7	7.4	42.9	6.7	34.8	5.3	23.9	19.1	21.5	17.2	17.7	14.2	56.4	41.1	49.3
44.0	42.5	82.9	16.0	76.2	15.2	61.1	10.7	48.3	7.5	43.4	6.8	35.2	5.3	24.2	19.4	21.8	17.4	17.9	14.3	57.1	41.6	49.9
44.5	43.0	83.8	16.2	77.1	15.3	61.8	10.8	48.8	7.6	43.9	6.8	35.6	5.4	24.5	19.6	22.0	17.6	18.1	14.5	57.8	42.1	50.5
45.0	43.5	84.8	16.4	78.0	15.5	62.5	10.9	49.4	7.7	44.4	6.9	36.0	5.4	24.8	19.8	22.3	17.8	18.3	14.7	58.5	42.6	51.1
45.5	44.0	85.8	16.6	78.9	15.7	63.2	11.1	49.9	7.8	44.9	7.0	36.4	5.5	25.1	20.1	22.6	18.0	18.5	14.8	59.1	43.1	51.6
46.0	44.5	86.8	16.8	79.8	15.9	63.9	11.2	50.5	7.9	45.4	7.1	36.8	5.6	25.4	20.3	22.8	18.2	18.8	15.0	59.8	43.6	52.2
46.5	45.0	87.7	17.0	80.7	16.0	64.7	11.3	51.1	8.0	45.9	7.2	37.2	5.6	25.6	20.5	23.1	18.5	19.0	15.2	60.5	44.0	52.6
	45.5	88.7	17.1	81.6	16.2	65.4	11.4	51.6	8.0	46.4	7.3	37.6	5.7	25.9	20.7	23.3	18.7	19.2	15.3	61.2	44.5	53.4
	46.0	89.7	17.3	82.5	16.4	66.1	11.5	52.2	8.1	46.9	7.4	38.0	5.7	26.2	21.0	23.6	18.9	19.4	15.5	61.9	45.0	54.0
	46.5	90.7	17.5	83.4	16.6	66.8	11.6	52.8	8.2	47.4	7.4	38.4	5.8	26.5	21.2	23.8	19.1	19.6	15.7	62.5	45.5	54.6
	47.0	91.6	17.7	84.2	16.8	67.5	11.7	53.3	8.3	47.9	7.5	38.8	5.8	26.8	21.4	24.1	19.3	19.8	15.8	63.2	46.0	55.2

TWO-DECK SHIPS.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Breadth when the breadth is .3 the length.	Dimensions of Ship.	FIRST EXAMPLE.																					
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
	Breadth when the breadth is .27 the length.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
49.5	46.0	89.7	17.3	80.8	15.6	62.1	10.7	54.3	8.5	47.8	7.4	39.9	6.2	28.1	21.0	24.2	18.1	20.2	15.1	62.8	46.5	53.7
51.0	46.5	90.7	17.5	81.7	15.7	62.8	10.9	54.9	8.5	48.3	7.5	40.4	6.3	28.4	21.3	24.4	18.3	20.4	15.3	63.5	47.0	54.4
51.5	47.0	91.7	17.7	82.5	15.9	63.5	11.0	55.5	8.6	48.8	7.6	40.8	6.4	28.7	21.5	24.7	18.5	20.6	15.5	64.2	47.5	55.1
52.0	47.5	92.6	17.9	83.4	16.1	64.2	11.1	56.0	8.7	49.3	7.7	41.2	6.4	29.0	21.7	24.9	18.7	20.9	15.6	64.9	48.0	55.9
52.5	48.0	93.6	18.1	84.3	16.3	64.8	11.2	56.6	8.8	49.8	7.8	41.7	6.5	29.3	21.9	25.1	18.8	21.1	15.8	65.6	48.5	56.6
53.0	48.5	94.6	18.3	85.2	16.4	65.5	11.3	57.2	8.9	50.4	7.8	42.1	6.6	29.6	22.2	25.4	19.0	21.3	16.0	66.3	49.0	57.2
53.5	49.0	95.5	18.5	86.0	16.6	66.2	11.4	57.8	9.0	50.9	7.9	42.5	6.6	29.9	22.4	25.6	19.2	21.5	16.1	66.9	49.5	57.9
54.0	49.5	96.5	18.6	86.9	16.8	66.9	11.5	58.4	9.1	51.4	8.0	43.0	6.7	30.2	22.6	25.8	19.4	21.7	16.3	67.6	50.0	58.6
54.5	50.0	97.5	18.8	87.8	16.9	67.5	11.7	59.0	9.2	51.9	8.1	43.4	6.8	30.5	22.9	26.1	19.6	21.9	16.5	68.3	50.5	59.3
55.0	50.5	98.4	19.0	88.7	17.1	68.2	11.8	59.6	9.3	52.4	8.2	43.8	6.9	30.8	23.1	26.3	19.8	22.2	16.6	69.0	51.1	59.9
55.5	51.0	99.4	19.2	89.6	17.3	68.9	11.9	60.2	9.4	52.9	8.3	44.3	6.9	31.1	23.3	26.6	19.9	22.4	16.8	69.7	51.6	60.6
56.0	51.5	100.4	19.4	90.4	17.4	69.6	12.0	60.8	9.5	53.5	8.3	44.7	7.0	31.4	23.6	26.8	20.1	22.6	17.0	70.4	52.1	61.3
56.5	52.0	101.3	19.6	91.3	17.6	70.2	12.1	61.4	9.6	54.0	8.4	45.2	7.0	31.7	23.8	27.1	20.3	22.8	17.1	71.0	52.6	62.0
57.0	52.5	102.3	19.8	92.2	17.8	70.9	12.2	61.9	9.7	54.5	8.5	45.6	7.1	32.0	24.0	27.3	20.5	23.0	17.3	71.7	53.1	62.7
57.5	53.0	103.3	19.9	93.1	17.9	71.6	12.4	62.5	9.7	55.0	8.6	46.0	7.2	32.3	24.2	27.6	20.7	23.3	17.4	72.4	53.6	63.4
58.0	53.5	104.2	20.1	94.0	18.1	72.3	12.5	63.1	9.8	55.5	8.7	46.5	7.2	32.6	24.5	27.8	20.8	23.5	17.6	73.1	54.1	64.1
58.5	54.0	105.2	20.3	94.8	18.3	72.9	12.6	63.7	9.9	56.0	8.7	46.9	7.3	32.9	24.7	28.0	21.0	23.7	17.8	73.8	54.6	64.8
AS SWEDISH EIGHTY-GUN SHIP.																						
	47.0	91.6	16.2	85.2	14.3	65.6	11.5	54.5	8.4	48.3	7.5	39.0	6.0	32.8	21.0	29.0	19.1	23.6	15.6	69.0	48.7	46.8
	47.5	92.6	16.4	86.1	14.5	66.3	11.7	55.1	8.5	48.9	7.6	39.4	6.1	33.2	21.2	29.3	19.3	23.9	15.8	69.8	49.2	47.3
	48.0	93.6	16.6	87.0	14.6	67.0	11.8	55.7	8.6	49.4	7.6	39.8	6.2	33.5	21.4	29.6	19.5	24.1	15.9	70.5	49.7	47.8
	48.5	94.6	16.7	87.9	14.8	67.7	11.9	56.3	8.7	49.9	7.7	40.2	6.2	33.9	21.7	29.9	19.7	24.4	16.1	71.2	50.2	48.3
	49.0	95.5	16.9	88.9	14.9	68.4	12.0	56.8	8.8	50.4	7.8	40.6	6.3	34.2	21.9	30.2	19.9	24.7	16.3	72.0	50.7	48.8
	49.5	96.5	17.1	89.8	15.1	69.0	12.2	57.4	8.9	50.9	7.9	41.0	6.4	34.6	22.1	30.5	20.1	24.9	16.4	72.7	51.3	49.3
	50.0	97.5	17.2	90.7	15.2	69.8	12.3	58.0	9.0	51.4	8.0	41.5	6.4	34.9	22.3	30.8	20.3	25.2	16.6	73.4	51.8	49.8

TWO-DECK SHIPS—(*Continued.*)

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Dimensions of Ship.		SECOND EXAMPLE.																			
		LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
Breadth when the breadth is .24 the length.	Breadth when the breadth is .26 the length.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
49.5	46.0	90.6	17.5	82.5	15.9	63.4	11.0	53.1	8.2	47.8	7.4	39.4	5.9	27.6	20.7	23.5	17.6	19.3	14.5	64.1	44.8	50.7
50.0	46.5	91.6	17.7	83.4	16.1	64.1	11.1	53.7	8.3	48.3	7.4	39.8	6.2	27.9	20.9	23.7	17.8	19.5	14.6	64.8	45.3	51.2
50.5	47.0	92.6	17.9	84.2	16.3	64.8	11.2	54.3	8.4	48.8	7.5	40.2	6.2	28.2	21.1	24.0	18.0	19.7	14.8	65.5	45.8	51.8
51.0	47.5	93.6	18.1	85.1	16.5	65.5	11.3	54.9	8.5	49.4	7.6	40.6	6.3	28.5	21.4	24.2	18.2	19.9	15.0	66.2	46.3	52.3
51.5	48.0	94.6	18.3	86.0	16.6	66.2	11.4	55.4	8.5	49.9	7.7	41.0	6.4	28.8	21.6	24.5	18.3	20.2	15.1	66.8	46.8	52.9
52.0	48.5	95.5	18.5	86.9	16.8	66.9	11.5	56.0	8.6	50.4	7.8	41.4	6.4	29.1	21.8	24.7	18.5	20.4	15.3	67.5	47.3	53.4
52.5	49.0	96.5	18.6	87.8	17.0	67.6	11.7	56.6	8.7	50.9	7.8	41.8	6.5	29.4	22.0	25.0	18.7	20.6	15.4	68.2	47.8	54.0
53.0	49.5	97.5	18.8	88.7	17.1	68.3	11.8	57.2	8.8	51.4	7.9	42.2	6.6	29.7	22.3	25.2	18.9	20.8	15.6	68.9	48.3	54.5
53.5	50.0	98.5	19.0	89.6	17.3	68.9	11.9	57.7	8.9	52.0	8.0	42.6	6.6	30.0	22.5	25.5	19.1	21.0	15.7	69.6	48.7	55.1
54.0	50.5	99.5	19.2	90.5	17.5	69.6	12.0	58.3	9.0	52.5	8.1	43.0	6.7	30.3	22.7	25.7	19.3	21.2	15.9	70.3	49.2	55.6
54.5	51.0	100.5	19.4	91.4	17.7	70.3	12.1	58.9	9.1	53.0	8.2	43.5	6.8	30.6	22.9	26.0	19.5	21.4	16.1	71.0	49.7	56.2
55.0	51.5	101.4	19.6	92.3	17.8	71.0	12.2	59.5	9.2	53.5	8.2	43.9	6.8	30.9	23.2	26.3	19.7	21.6	16.2	71.7	50.2	56.7
55.5	52.0	102.4	19.8	93.2	18.0	71.7	12.4	60.1	9.3	54.0	8.3	44.3	6.9	31.2	23.4	26.5	19.9	21.8	16.4	72.4	50.7	57.3
56.0	52.5	103.4	20.0	94.1	18.2	72.3	12.5	60.6	9.3	54.6	8.4	44.7	7.0	31.5	23.6	26.8	20.1	22.0	16.5	73.1	51.2	57.8
56.5	53.0	104.4	20.2	95.0	18.4	73.1	12.7	61.2	9.4	55.1	8.5	44.2	7.1	31.8	23.8	27.0	20.3	22.3	16.7	73.8	51.7	58.4
57.0	53.5	105.4	20.4	95.9	18.5	73.8	12.8	61.8	9.5	55.6	8.6	44.6	7.1	32.1	24.1	27.3	20.5	22.5	16.8	74.5	52.2	58.9
57.5	54.0	106.4	20.6	96.8	18.7	74.5	12.9	62.4	9.6	56.1	8.6	45.0	7.2	32.4	24.3	27.5	20.6	22.7	17.0	75.2	52.6	59.5

TWO-DECK SHIPS—(*Continued.*)

Lengths of Booms, Yards, &c.

Dimensions of Ship.		FIRST EXAMPLE.																	
		MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.									
Length when the length is 3.33 the breadth.	Length when the length is 3.67 the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
167.0	170	93.4	68.0	44.2	30.9	81.9	59.2	38.7	27.0	68.0	44.4	30.9	21.8	63.6	48.6	14.9	29.1	56.0	59.2
168.0	171	94.0	68.4	44.5	31.1	82.4	59.5	38.9	27.2	68.4	44.6	31.0	21.9	64.0	48.8	15.0	29.3	56.4	59.5
169.0	172	94.5	68.8	44.7	31.3	82.9	59.9	39.1	27.3	68.8	44.9	31.2	22.0	64.4	49.1	15.1	29.5	56.7	59.9
170.0	173	95.0	69.2	45.0	31.5	83.3	60.2	39.3	27.5	69.2	45.1	31.4	22.2	64.7	49.4	15.1	29.6	57.0	60.2
171.0	174	95.6	69.6	45.2	31.7	83.8	60.5	39.6	27.6	69.6	45.4	31.6	22.3	65.1	49.7	15.2	29.8	57.3	60.5
172.0	175	96.1	70.0	45.5	31.8	84.3	60.9	39.8	27.8	70.0	45.7	31.7	22.4	65.5	49.9	15.3	30.0	57.7	60.9
173.0	176	96.7	70.4	45.7	32.0	84.7	61.2	40.0	27.9	70.4	45.9	31.9	22.5	65.9	50.2	15.4	30.1	58.0	61.2
174.0	177	97.2	70.8	46.0	32.2	85.2	61.6	40.2	28.1	70.8	46.2	32.1	22.6	66.2	50.5	15.5	30.3	58.3	61.6
175.0	178	97.7	71.1	46.2	32.4	85.7	61.9	40.4	28.3	71.1	46.4	32.3	22.8	66.6	50.8	15.6	30.5	58.6	61.9
176.0	179	98.3	71.5	46.5	32.5	86.2	62.2	40.7	28.4	71.5	46.7	32.4	22.9	67.0	51.1	15.7	30.6	59.0	62.2
177.0	180	98.8	71.9	46.7	32.7	86.6	62.6	40.9	28.6	71.9	46.9	32.6	23.1	67.3	51.3	15.8	30.8	59.3	62.6
178.0	181	99.4	72.3	47.0	32.9	87.1	62.9	41.1	28.7	72.3	47.2	32.8	23.3	67.7	51.6	16.0	30.9	59.6	62.9
179.0	182	99.9	72.6	47.2	33.1	87.5	63.2	41.3	28.9	72.7	47.4	33.0	23.4	68.1	51.9	16.0	31.1	59.9	63.2
180.0	183	100.4	73.0	47.5	33.2	88.1	63.6	41.5	29.0	73.1	47.7	33.1	23.5	68.4	52.2	16.1	31.3	60.3	63.6
181.0	184	100.9	73.4	47.7	33.4	88.5	63.9	41.8	29.2	73.5	47.9	33.3	23.7	68.7	52.5	16.2	31.4	60.6	63.9
182.0	185	101.5	73.8	48.0	33.6	88.9	64.2	42.0	29.3	73.9	48.2	33.5	23.9	69.1	52.9	16.3	31.6	60.9	64.2
SWEDISH EIGHTY-GUN SHIP.																			
	175	95.9	73.5	48.1	37.6	85.3	65.3	43.3	32.9	69.6	53.0	35.6	27.1	63.5	43.3	26.0	28.5		
	176	96.4	74.0	48.4	37.9	85.8	65.7	43.6	33.1	70.0	53.3	35.8	27.2	63.9	43.5	26.1	28.8		
	177	97.0	74.4	48.7	38.1	86.3	66.0	43.8	33.3	70.4	53.6	36.0	27.4	64.2	43.7	26.3	28.9		
	178	97.5	74.8	48.9	38.3	86.8	66.4	44.1	33.5	70.8	53.9	36.2	27.5	64.6	44.0	26.4	29.0		
	179	98.0	75.2	49.2	38.5	87.3	66.4	44.3	33.7	71.2	54.2	36.4	27.7	65.0	44.2	26.6	29.2		
	180	98.6	75.6	49.5	38.7	87.8	67.1	44.6	33.9	71.6	54.5	36.6	27.8	65.3	44.5	26.7	29.4		
	181	99.2	76.1	49.8	38.9	88.3	67.5	44.8	34.1	72.0	54.9	36.8	28.0	65.7	44.7	26.9	29.5		
	182	99.7	76.5	50.0	39.1	88.8	67.9	45.1	34.3	72.4	55.2	37.0	28.1	66.1	45.0	27.0	29.7		
	183	100.3	76.9	50.3	39.4	89.2	68.3	45.3	34.4	72.8	55.5	37.2	28.3	66.4	45.2	27.2	29.8		
	184	100.8	77.3	50.6	39.6	89.7	68.6	45.6	34.6	73.2	55.8	37.4	28.5	66.8	45.5	27.3	30.0		
	185	101.4	77.7	50.9	39.8	90.2	69.0	45.8	34.8	73.6	56.1	37.7	28.6	67.1	45.7	27.4	30.2		
	186	101.9	78.2	51.1	40.0	90.7	69.4	46.1	35.0	74.0	56.4	37.9	28.8	67.5	46.0	27.6	30.3		

TWO-DECK SHIPS—(*Continued.*)—*Lengths of Booms, Yards, &c.*

Length when the length is 3.35 the breadth.	Dimensions of Ship.	SECOND EXAMPLE.																	
		MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.									
	Length when the length is 3.67 the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Spirit-sail-yard.
168.0	177	94.3	67.6	41.9	29.3	81.6	59.0	35.3	28.2	67.6	44.6	30.6	21.4	64.1	49.4	14.8	34.5	56.6	59.0
169.0	178	94.9	68.0	42.2	29.5	82.1	59.3	35.5	28.4	68.0	44.9	30.8	21.5	64.4	49.7	14.9	34.7	56.9	59.3
170.0	179	95.4	68.4	42.4	29.7	82.5	59.6	35.7	28.5	68.4	45.1	30.9	21.7	64.8	49.9	15.0	34.9	57.2	59.6
171.0	180	95.9	68.8	42.6	29.8	83.0	60.0	35.9	28.7	68.8	45.4	31.1	21.8	65.2	50.2	15.1	35.1	57.5	60.0
172.0	181	96.5	69.2	42.9	30.0	83.4	60.3	36.1	28.9	69.2	45.6	31.3	21.9	65.5	50.5	15.2	35.3	57.9	60.3
173.0	182	97.0	69.5	43.1	30.2	83.9	60.6	36.3	29.0	69.5	45.9	31.5	22.0	65.9	50.8	15.2	35.5	58.2	60.6
174.0	183	97.5	69.9	43.3	30.3	84.4	61.0	36.5	29.2	69.9	46.1	31.6	22.1	66.2	51.0	15.3	35.7	58.5	61.0
175.0	184	98.0	70.3	43.6	30.5	84.8	61.3	36.7	29.3	70.3	46.4	31.8	22.3	66.6	51.3	15.4	35.9	58.8	61.3
176.0	185	98.6	70.7	43.8	30.7	85.3	61.6	36.9	29.5	70.7	46.6	32.0	22.4	67.0	51.6	15.5	36.1	59.1	61.6
177.0	186	99.1	71.1	44.1	30.8	85.8	62.0	37.0	29.7	71.1	46.9	32.2	22.5	67.3	51.8	15.6	36.2	59.5	62.0
179.0	187	99.6	71.4	44.5	31.0	86.2	62.3	37.2	29.8	71.4	47.2	32.3	22.6	67.7	52.1	15.6	36.4	59.8	62.3
180.0	188	100.2	71.8	44.5	31.2	86.7	62.6	37.4	30.0	71.8	47.4	32.5	22.8	68.0	52.4	15.7	36.6	60.1	62.6
181.0	189	100.7	72.2	44.8	31.3	87.1	63.0	37.6	30.1	72.2	47.7	32.7	22.9	68.4	52.7	15.8	36.8	60.4	63.0
182.0	190	101.2	72.6	45.0	31.5	87.6	63.3	37.8	30.3	72.6	47.9	32.9	23.0	68.8	52.9	15.9	37.0	60.7	63.3
183.0	191	101.8	73.0	45.2	31.7	88.1	63.6	38.0	30.5	73.0	48.2	33.0	23.1	69.1	53.2	16.0	37.2	61.0	63.6
184.0	192	102.3	73.4	45.5	31.8	88.5	64.0	38.2	30.6	73.4	48.4	33.2	23.2	69.5	53.5	16.1	37.4	61.4	64.0
185.0	193	102.8	73.7	45.7	32.0	89.0	64.3	38.4	30.8	73.7	48.7	33.4	23.4	69.9	53.7	16.1	37.6	61.7	64.3
186.0	194	103.3	74.1	46.0	32.2	89.4	64.6	38.6	30.9	74.1	48.9	33.5	23.5	70.2	54.0	16.2	37.8	62.0	64.6
187.0	195	103.9	74.5	46.2	32.3	89.9	65.0	38.8	31.1	74.5	49.2	33.7	23.6	70.6	54.3	16.3	38.0	62.3	65.0
188.0	196	104.4	74.9	46.4	32.5	90.4	65.3	39.0	31.2	74.9	49.4	33.9	23.7	70.9	54.6	16.4	38.1	62.6	65.3
189.0	197	104.9	75.3	46.7	32.7	90.8	65.6	39.2	31.4	75.3	49.7	34.1	23.8	71.3	54.8	16.5	38.3	62.9	65.6
190.0	198	105.5	75.6	46.9	32.8	91.3	66.0	39.4	31.6	75.6	49.9	34.2	24.0	71.7	55.1	16.5	38.5	63.2	66.0
191.0	199	106.0	76.0	47.1	33.0	91.7	66.3	39.6	31.7	76.0	50.2	34.4	24.1	72.0	55.4	16.6	38.7	63.6	66.3
192.0	200	106.5	76.4	47.4	33.2	92.2	66.6	39.8	31.9	76.4	50.4	34.6	24.2	72.4	55.6	16.7	38.9	63.9	66.6
193.0	201	107.1	76.8	47.6	33.3	92.7	67.0	40.0	32.0	76.8	50.7	34.8	24.3	72.8	55.9	16.8	39.1	64.2	67.0
194.0	202	107.6	77.2	47.8	33.5	93.1	67.3	40.2	32.2	77.2	50.9	34.9	24.4	73.1	56.2	16.9	39.3	64.5	67.3
195.0	203	108.1	77.6	48.1	33.7	93.6	67.6	40.4	32.4	77.6	51.2	35.1	24.6	73.5	56.4	17.0	39.5	64.9	67.6
196.0	204	108.6	77.9	48.3	33.8	94.1	68.0	40.6	32.5	77.9	51.4	35.3	24.7	73.8	56.7	17.0	39.7	65.2	68.0
197.0	205	109.1	78.3	48.6	34.0	94.5	68.3	40.8	32.7	78.3	51.7	35.4	24.8	74.2	57.0	17.1	39.9	65.5	68.3

THREE-DECK SHIPS.

Lengths of Lower-masts, Top-masts, Top-gallant-masts, Bowsprits, Jib-booms, and Flying Jib-booms.

Breadth when 3. of the length.	Dimensions of Ship.	LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.						Bowsprit.	Jib-boom.	Flying-jib-boom.
		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.				
	Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded.	Pole.	Hounded.	Pole.	Hounded.	Pole.			
	1st Exam.																					
52.0	50.0	99.6	19.2	92.6	17.9	68.7	11.9	60.5	9.9	55.1	8.6	43.5	6.7	30.5	22.9	27.7	20.8	20.3	15.2	70.3	52.2	63.3
53.0	50.5	100 0	19.4	93.5	18.1	69.4	12.0	61.1	10.0	55.7	8.7	44.2	6.8	30.8	23.1	28.0	21.0	20.5	15.4	71.0	52.7	63.9
54.0	51.0	101.5	19.6	94.5	18.3	70.1	12.1	61.7	10.1	56.2	8.8	44.6	6.8	31.1	23.3	28.3	21.2	20.7	15.5	71.7	53.2	64.5
55.0	51.5	102.6	19.8	95.4	18.4	70.8	12.2	62.3	10.2	56.8	8.8	45.1	6.9	31.4	23.6	28.6	21.4	20.9	15.7	72.4	53.8	65.2
56.0	52.0	103.6	20.0	96.3	18.6	71.5	12.4	62.9	10.3	57.3	8.9	45.4	7.0	31.7	23.8	28.9	21.6	21.1	15.8	73.1	54.3	65.8
57.0	52.5	104.6	20.2	97.2	18.8	72.2	12.5	63.5	10.4	57.9	9.0	45.7	7.1	32.0	24.0	29.1	21.8	21.3	16.0	73.8	54.8	66.4
58.0	53.0	105.6	20.4	98.2	19.0	72.8	12.6	64.1	10.5	58.4	9.1	46.1	7.1	32.3	24.2	29.4	22.0	21.5	16.1	74.5	55.4	67.1
59.0	53.5	106.6	20.6	99.1	19.1	73.5	12.7	64.7	10.6	59.0	9.2	46.5	7.2	32.6	24.5	29.7	22.2	21.7	16.3	75.2	55.9	67.7
60.0	54.0	107.6	20.8	100.0	19.3	74.2	12.8	65.3	10.7	59.5	9.3	46.9	7.2	32.9	24.7	30.0	22.4	21.9	16.4	75.9	56.5	68.3
60.6	54.5	108.6	21.0	101.0	19.5	74.9	12.9	65.9	10.8	60.1	9.4	47.3	7.3	33.2	24.9	30.2	22.6	22.1	16.6	76.6	56.9	69.0
61.0	55.0	109.6	21.2	101.9	19.7	75.6	13.1	66.5	10.9	60.6	9.4	47.7	7.3	33.5	25.2	30.5	22.8	22.3	16.7	77.3	57.5	69.6
61.6	55.5	110.5	21.4	102.8	19.9	76.3	13.2	67.1	11.0	61.2	9.5	48.1	7.4	33.8	25.4	30.8	23.1	22.5	16.9	78.0	58.0	70.2
62.0	56.0	111.5	21.6	103.7	20.0	77.0	13.3	67.8	11.1	61.7	9.6	48.5	7.4	34.2	25.6	31.1	23.3	22.7	17.1	78.7	58.5	70.9
	2nd Exam.																					
51.0	50.0	97.0	18.7	86.3	16.6	68.9	11.9	58.0	9.0	51.6	8.0	41.2	6.4	30.0	22.5	26.7	20.0	19.8	14.8	70.8	49.5	59.5
52.0	50.5	98.0	18.9	87.2	16.8	69.5	12.0	58.6	9.1	52.1	8.1	41.6	6.5	30.3	22.7	27.0	20.2	20.0	15.0	71.5	50.0	60.0
53.0	51.0	98.9	19.1	88.0	17.0	70.2	12.1	59.2	9.2	52.6	8.2	42.0	6.5	30.6	22.9	27.2	20.4	20.2	15.1	72.2	50.5	60.6
54.0	51.5	99.9	19.3	88.9	17.1	70.9	12.2	59.7	9.3	53.2	8.3	42.4	6.6	30.9	23.2	27.5	20.6	20.4	15.3	72.9	51.0	61.2
55.0	52.0	100.9	19.5	89.8	17.2	71.6	12.4	60.3	9.4	53.7	8.4	42.8	6.7	31.2	23.4	27.8	20.8	20.6	15.4	73.6	51.5	61.8
56.0	52.5	101.8	19.7	90.6	17.4	72.3	12.5	60.9	9.5	54.2	8.4	43.2	6.7	31.5	23.6	28.0	21.0	20.8	15.6	74.4	52.0	62.4
57.0	53.0	102.8	19.9	91.5	17.6	73.0	12.6	61.5	9.6	54.7	8.5	43.6	6.8	31.8	23.8	28.3	21.2	21.0	15.7	75.0	52.5	63.0
58.0	53.5	103.8	20.1	92.4	17.8	73.7	12.7	62.1	9.7	55.2	8.6	44.1	6.9	32.1	24.1	28.6	21.4	21.2	15.9	75.7	53.0	63.6
58.5	54.0	104.8	20.2	93.2	18.0	74.4	12.8	62.6	9.8	55.7	8.7	44.5	6.9	32.4	24.3	28.8	21.6	21.4	16.0	76.4	53.5	64.2
59.0	54.5	105.7	20.4	94.1	18.2	75.1	12.9	63.2	9.9	56.3	8.8	44.9	7.0	32.7	24.5	29.1	21.8	21.6	16.2	77.2	54.0	64.8
59.5	55.0	106.7	20.6	95.0	18.4	75.7	13.1	63.8	9.9	56.8	8.8	45.3	7.1	33.0	24.7	29.4	22.0	21.8	16.3	77.9	54.5	65.4
60.0	55.5	107.7	20.8	95.8	18.6	76.4	13.2	64.0	10.0	57.3	8.9	45.7	7.1	33.3	25.0	29.6	22.2	22.0	16.5	78.6	55.0	66.0
60.5	56.0	108.6	21.0	96.7	18.7	77.1	13.3	65.4	10.1	57.8	9.0	46.1	7.2	33.6	25.2	29.9	22.4	22.2	16.6	79.3	55.5	66.6

THREE-DECK SHIPS—(*Continued.*)—*Lengths of Yards, Booms, &c*

FIRST EXAMPLE.

Dimensions of Ship.		MAIN-YARDS.				FORE-YARDS.				MIZEN-YARDS.									
Length when the length is 3.8 the breadth.	Length of Ship when length is 3.6 the breadth.	Lower.	Top-sail.	Top-gallant.	Royal.	Lower.	Top-sail.	Top-gallant.	Royal.	Cross-jack.	Top-sail.	Top-gallant.	Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
193	186	99.1	70.9	46.9	35.1	89.1	63.8	42.2	32.0	70.9	51.1	34.6	27.0	65.0	50.8	15.2	30.4	59.4	63.8
194	187	99.6	71.3	47.1	35.3	89.6	64.1	42.4	32.2	71.3	51.4	34.8	27.1	65.4	51.0	15.3	30.6	59.7	64.1
195	188	100.2	71.7	47.4	35.5	90.1	64.5	42.6	32.4	71.7	51.7	35.0	27.3	65.8	51.3	15.4	30.8	60.1	64.5
196	189	100.7	72.1	47.6	35.7	90.6	64.8	42.8	32.5	72.1	51.9	35.2	27.4	66.1	51.6	15.4	30.8	60.4	64.8
197	190	101.2	72.5	47.9	35.9	91.1	65.2	43.1	32.7	72.5	52.2	35.4	27.5	66.4	51.8	15.5	31.0	60.7	65.2
198	191	101.8	72.9	48.1	36.0	91.6	65.6	43.3	32.9	72.9	52.4	35.6	27.7	66.8	52.1	15.6	31.2	61.0	65.6
199	192	102.3	73.3	48.4	36.2	92.0	65.9	43.5	33.0	73.3	52.7	35.8	27.9	67.1	52.4	15.7	31.4	61.3	65.9
200	193	102.8	73.6	48.6	36.4	92.5	66.3	43.7	33.2	73.6	53.0	36.0	28.0	67.5	52.7	15.8	31.6	61.6	66.3
201	194	103.3	74.0	48.8	36.6	92.9	66.6	43.9	33.4	74.0	53.2	36.1	28.1	67.8	52.9	15.8	31.6	61.9	66.6
202	195	103.9	74.4	49.1	36.8	93.5	66.9	44.1	33.5	74.4	53.5	36.3	28.3	68.2	53.2	15.9	31.8	62.3	66.9
203	196	104.4	74.8	49.3	37.0	94.0	67.3	44.3	33.7	74.8	53.8	36.5	28.4	68.5	53.5	16.0	32.0	62.6	67.3
204	197	104.9	75.2	49.6	37.1	94.4	67.6	44.6	33.9	75.2	54.1	36.7	28.6	68.9	53.7	16.1	32.2	62.9	67.6
205	198	105.5	75.5	49.8	37.3	95.0	67.9	44.8	34.1	75.5	54.4	36.9	28.7	69.2	54.0	16.2	32.4	63.3	67.9
206	199	106.0	75.9	50.1	37.5	95.4	68.3	45.0	34.2	75.9	54.6	37.1	28.8	69.6	54.3	16.3	32.6	63.6	68.3
207	200	106.5	76.3	50.3	37.7	95.9	68.6	45.2	34.4	76.3	54.9	37.3	29.0	69.9	54.6	16.3	32.7	63.9	68.6
208	201	107.1	76.7	50.6	37.9	96.3	69.0	45.5	34.6	76.7	55.2	37.5	29.2	70.3	54.8	16.4	32.8	64.2	69.0
209	202	107.6	77.1	50.8	38.0	96.8	69.3	45.7	34.8	77.1	55.5	37.6	29.3	70.6	55.1	16.5	33.0	64.5	69.3
210	203	108.1	77.5	51.1	38.2	97.2	69.7	45.9	35.0	77.5	55.7	37.8	29.5	71.0	55.4	16.6	33.2	64.8	69.7
	204	108.6	77.8	51.3	38.4	97.7	70.0	46.1	35.2	77.8	56.0	38.0	29.6	71.3	55.7	16.7	33.4	65.1	70.0
	205	109.2	78.2	51.6	38.6	98.2	70.3	46.4	35.3	78.2	56.2	38.2	29.7	71.7	55.9	16.7	33.5	65.5	70.3
	206	109.7	78.6	51.8	38.8	98.7	70.7	46.6	35.5	78.6	56.5	38.4	29.9	72.0	56.2	16.8	33.7	65.8	70.7
	207	110.2	79.0	52.1	39.0	99.1	71.1	46.8	35.7	79.0	56.8	38.6	30.1	72.4	56.5	16.9	33.9	66.1	71.1
	208	110.8	79.4	52.4	39.3	99.7	71.4	47.1	35.8	79.4	57.1	38.8	30.2	72.7	56.8	17.0	34.0	66.4	71.4
	209	111.3	79.7	52.7	39.5	100.1	71.7	47.4	36.0	79.7	57.4	39.0	30.4	73.1	57.0	17.1	34.2	66.7	71.7
	210	111.9	80.1	53.0	39.8	100.7	72.0	47.7	36.2	80.1	57.7	39.2	30.5	73.5	57.3	17.2	34.3	67.1	72.0

SECOND EXAMPLE.

Length when the length is 3.8 the breadth.	Length of Ship when length is 3.6 the breadth.	Main Lower.	Main Top-sail.	Main Top-gallant.	Main Royal.	Fore Lower.	Fore Top-sail.	Fore Top-gallant.	Fore Royal.	Cross-jack.	Mizen Top-sail.	Mizen Top-gallant.	Mizen Royal.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.
180	186	98.6	70.7	47.4	33.2	85.2	61.5	41.3	28.9	70.7	46.9	32.1	22.5	67.0	50.2	15.1	30.1	59.1	61.5
181	187	99.1	71.1	47.7	33.4	85.7	61.8	41.5	29.0	71.1	47.2	32.3	22.6	67.3	50.5	15.1	30.3	59.5	61.8
182	188	99.2	71.5	47.9	33.5	86.1	62.1	41.7	29.2	71.5	47.4	32.4	22.7	67.7	50.8	15.2	30.4	59.8	62.1
183	189	100.2	71.9	48.2	33.7	86.6	62.4	41.9	29.3	71.9	47.7	32.6	22.8	68.0	51.0	15.3	30.6	60.1	62.4
184	190	100.7	72.2	48.4	33.9	87.0	62.8	42.1	29.5	72.2	47.9	32.8	22.9	68.4	51.3	15.4	30.8	60.4	62.8
185	191	101.2	72.6	48.7	34.1	87.5	63.1	42.3	29.6	72.6	48.2	32.9	23.1	68.8	51.6	15.5	30.9	60.7	63.1
186	192	101.8	73.0	48.9	34.2	87.9	63.4	42.6	29.8	73.0	48.4	33.1	23.2	69.1	51.8	15.5	31.1	61.0	63.4
187	193	102.3	73.4	49.2	34.4	88.4	63.7	42.8	29.9	73.4	48.7	33.3	23.3	69.5	52.1	15.6	31.3	61.4	63.7
188	194	102.8	73.7	49.4	34.6	88.9	64.1	43.0	30.1	73.7	48.9	33.4	23.4	69.8	52.4	15.7	31.4	61.7	64.1
189	195	103.3	74.1	49.7	34.8	89.3	64.4	43.2	30.3	74.1	49.2	33.6	23.5	70.2	52.6	15.8	31.6	62.0	64.4
190	196	103.9	74.5	49.9	34.9	89.8	64.7	43.4	30.4	74.5	49.4	33.8	23.6	70.6	52.9	15.9	31.7	62.3	64.7
191	197	104.4	74.9	50.2	35.1	90.2	65.0	43.7	30.5	74.9	49.7	33.9	23.8	70.9	53.2	15.9	31.9	62.6	65.0
192	198	104.9	75.3	50.4	35.3	90.7	65.4	43.9	30.7	75.3	49.9	34.1	23.9	71.3	53.5	16.0	32.1	63.0	65.4
193	199	105.5	75.6	50.7	35.5	91.1	65.7	44.1	30.8	75.6	50.2	34.3	24.0	71.6	53.7	16.1	32.2	63.3	65.7
194	200	106.0	76.0	50.9	35.6	91.6	66.0	44.3	31.0	76.0	50.4	34.4	24.1	72.0	54.0	16.2	32.4	63.6	66.0
195	201	106.5	76.4	51.2	35.8	92.1	66.3	44.5	31.1	76.4	50.7	34.6	24.2	72.4	54.3	16.3	32.6	63.9	66.3
196	202	107.1	76.8	51.4	36.0	92.5	66.6	44.7	31.3	76.8	50.9	34.8	24.3	72.7	54.5	16.4	32.8	64.2	66.7
197	203	107.6	77.1	51.6	36.1	93.0	67.0	44.9	31.4	77.1	51.2	34.9	24.5	73.1	54.8	16.4	32.9	64.5	67.0
198	204	108.1	77.5	51.9	36.3	93.4	67.3	45.1	31.6	77.5	51.4	35.1	24.6	73.4	55.1	16.5	33.0	64.9	67.3
199	205	108.6	77.9	52.1	36.5	93.9	67.6	45.4	31.8	77.9	51.6	35.3	24.8	73.8	55.3	16.6	33.2	65.2	67.6
200	206	109.2	78.3	52.4	36.7	94.3	67.9	45.7	31.9	78.3	51.9	35.5	24.9	74.2	55.6	16.7	33.4	65.5	67.9
201	207	109.7	78.6	52.6	36.9	94.8	68.3	46.0	32.0	78.6	52.1	35.7	25.0	74.5	55.9	16.8	33.5	65.8	68.2
202	208	110.2	79.0	52.9	37.1	95.3	68.6	46.4	32.2	79.0	52.3	35.8	25.1	74.9	56.2	16.8	33.7	66.1	68.6
203	209	110.8	79.3	53.1	37.3	95.7	68.9	46.7	32.3	79.4	52.6	36.0	25.2	75.2	56.4	16.9	33.8	66.5	68.9
204	210	111.3	79.6	53.4	37.5	96.0	69.3	47.1	32.4	79.8	52.8	36.2	25.3	75.6	56.7	17.0	34.0	66.8	69.2

ON THE MASTING OF STEAM-VESSELS.

The masting of steam-vessels is not subject to the same strict rules that are made to determine the masting of other classes of ships. The length of the masts and yards must, however, bear some general relation to the length and breadth of the vessel; but both this relation, and the positions of the masts, are subject to many variations depending on particular circumstances, especially on the service in which the vessel is to be employed, whether for long and short voyages, or only in rivers. The positions of the masts must, in many cases, be determined by the situation of the machinery, and the quantity of sail be regulated by the requirements incident to its employment. It is, however, important, on account of the obstruction which the masts and yards present in steaming head to wind, that they should be made as compact as possible.

Although it is desirable that the centre of effort should be kept as nearly as possible in a correct relation to the mean resultant of the water, when by the wind, yet from the great length of these vessels in relation to their breadth, any small deviation from that is not felt; the limits within which these vessels will answer well, being more extended than in other vessels.

In steam-vessels, the lower-mast should commonly be taunt; and the top-mast and top-gallant-mast in one, and of such a length that when it is struck, the pole only may be above the cap of the lower-mast. The yards should be made light, in order that as many as possible of the square sails may be set flying. The fore-and-aft sails may be as large as the space for conveniently working them will admit; for they can be easily struck; and if they were kept up, they would present but little obstruction in going head to wind.

In steam-vessels that are intended for long voyages (as crossing the Atlantic), it will be found necessary to admit considerable deviation from these rules, so far as they relate to the rig, strength of the yards, &c., since they would require some of their sails to be made of stout canvas, possibly No. 1; and the yards of larger diameters, in order to carry sail in bad weather, and for storm-sails.

LENGTHS OF MASTS, BOWSPRITS, GAFFS, YARDS, ETC.

STEAM-VESSELS WITH STUMP MASTS.

Breadth extreme.	MASTS.										Length on Deck.	YARDS.					Length on Deck.	YARDS—(*Continued*).				
	MAIN.					FORE.			BOWSPRIT.			MAIN.		FORE.				MAIN.		FORE.		
	Hound-ed.	Housed.	Headed.	Top-mast to Stops.	Pole.	To Stops.	Housed.	Pole.	Whole Length.	Housed.		Main-gaff.	Without Cleats.	Fore-gaff.	Without Cleats.	Spread Yard.		Main-gaff.	Without Cleats.	Fore gaff.	Without Cleats.	Spread Yard.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
13.0	29. 0	7.9	3.3	12.8	4.1	33.8	7.4	5.2	16.8	6.9	80	13.4	0.8	16.8	1.5	25.5	115	19.3	1.3	24.0	2.0	36.7
13.6	30. 7	8.1	3.5	13.2	4.3	35.0	7.8	5.5	17.7	7.1	81	13.6	0.8	17.0	1.5	25.9	116	19.5	1.3	24.2	2.0	37.0
14.0	31. 8	8.5	3.7	13.8	4.5	36.4	8.0	5.7	18.3	7.4	82	13.8	0.8	17.2	1.5	26.1	117	19.7	1.3	24.5	2.0	37.2
14.6	32. 9	8.9	3.8	14.2	4.7	37.8	8.3	5.9	18.8	7.7	83	13.9	0.8	17.4	1.5	26.4	118	19.8	1.4	24.7	2.0	37.6
15.0	33. 8	9.1	3.9	14.8	4.8	39.0	8.7	6.0	19.7	7.9	84	14.0	0.8	17.6	1.5	26.8	119	19.9	1.4	24.9	2.1	37.9
15.6	34. 9	9.4	4.0	15.1	4.9	40.3	8.9	6.2	20.3	8.1	85	14.2	0.8	17.9	1.5	27.0	120	20.1	1.4	25.0	2.1	38.2
16.0	36. 1	9.8	4.1	15.7	5.1	41.6	9.2	6.5	20.8	8.5	86	14.4	0.8	18.0	1.5	27.3	121	20.3	1.4	25.3	2.1	38.6
16.6	37. 3	10.0	4.3	16.1	5.3	42.9	9.5	6.7	21.7	8.8	87	14.6	0.8	18.1	1.5	27.7	122	20.5	1.4	25.5	2.1	38.9
17.0	38. 5	10.3	4.4	16.7	5.5	44.1	9.8	6.9	22.3	9.0	88	14.8	0.9	18.4	1.6	28.0	123	20.7	1.4	25.7	2.1	39.1
17.6	39. 7	10.7	4.6	17.1	5.7	45.5	10.0	7.1	22.8	9.2	89	14.9	0.9	18.6	1.6	28.3	124	20.9	1.4	25.9	2.1	39.5
18.0	40. 9	10.9	4.7	17.7	5.8	46.9	10.3	7.4	23.7	9.5	90	15.0	0.9	18.9	1.6	28.7	125	21.0	1.5	26.1	2.2	39.9
18.6	42. 0	11.2	4.8	18.1	5.9	48.1	10.7	7.6	24.2	9.9	91	15.2	0.9	19.0	1.6	29.0	126	21.1	1.5	26.4	2.2	40.0
19.0	43. 3	11.6	4.9	18.7	6.0	49.5	10.9	7.7	24.8	10.0	92	15.4	0.9	19.2	1.7	29.3	127	21.3	1.5	26.6	2.2	40.4
19.6	44. 6	11.9	5.0	19.0	6.2	50.8	11.2	7.9	25.6	10.3	93	15.6	0.9	19.4	1.7	29.6	128	21.5	1.5	26.8	2.2	40.8
20.0	45. 9	12.1	5.1	19.6	6.4	52.0	11.6	8.0	26.2	10.6	94	15.7	1.0	19.7	1.7	29.9	129	21.7	1.5	27.0	2.2	41.0
20.6	46.11	12.4	5.3	20.0	6.6	53.4	11.9	8.2	26.8	10.9	95	15.9	1.0	19.9	1.7	30.2	130	21.8	1.5	27.2	2.3	41.4
21.0	48. 1	12.8	5.4	20.6	6.8	54.8	12.0	8.5	27.6	11.0	96	16.1	1.0	20.0	1.7	30.6	131	21.9	1.5	27.4	2.3	41.8
21.6	49. 3	13.0	5.6	21.0	6.9	55.8	12.4	8.7	28.2	11.4	97	16.3	1.0	20.3	1.7	30.9	132	22.1	1.5	27.7	2.3	42.0
22.0	50. 5	13.3	5.7	21.6	7.0	57.3	12.7	8.9	28.9	11.7	98	16.5	1.0	20.5	1.7	31.2	133	22.3	1.6	27.9	2.3	42.4
22.6	51. 6	13.6	5.8	22.0	7.2	58.7	12.9	9.0	29.5	11.9	99	16.7	1.0	20.7	1.7	31.6	134	22.5	1.6	28.0	2.4	42.8
23.0	52. 8	13.9	5.9	22.6	7.4	59.8	13.2	9.2	30.1	12.1	100	16.8	1.1	20.9	1.8	31.9	135	22.7	1.6	28.2	2.4	43.0
23.6	53. 8	14.2	6.0	23.0	7.6	61.2	13.5	9.4	30.9	12.4	101	16.9	1.1	21.1	1.8	32.1	136	22.9	1.6	28.5	2.4	43.3
24.0	54. 9	14.5	6.1	23.6	7.7	62.5	13.9	9.6	31.5	12.8	102	17.1	1.1	21.3	1.8	32.5	137	23.0	1.6	28.7	2.4	43.7
24.6	56. 1	14.8	6.3	24.0	7.8	63.8	14.1	9.8	32.0	13.0	103	17.3	1.1	21.5	1.8	32.9	138	23.2	1.6	28.9	2.4	43.9
25.0	57. 3	15.0	6.4	24.5	7.9	65.0	14.4	10.0	32.8	13.2	104	17.5	1.1	21.7	1.8	33.1	139	23.4	1.6	29.0	2.4	44.2
25.6	58. 5	15.4	6.6	25.0	8.1	66.4	14.7	10.3	33.4	13.5	105	17.7	1.1	21.9	1.8	33.4	140	23.6	1.6	29.2	2.5	44.6
26.0	59. 7	15.8	6.7	25.5	8.3	67.8	14.9	10.5	34.0	13.8	106	17.8	1.2	22.1	1.9	33.8	141	23.8	1.6	29.5	2.5	44.8
26.6	60. 8	16.0	6.8	26.0	8.5	68.9	15.2	10.7	34.7	14.0	107	17.9	1.2	22.4	1.9	34.0	142	23.9	1.7	29.7	2.5	45.2
27.0	61. 8	16.4	6.9	26.5	8.7	70.3	15.5	10.9	35.3	14.2	108	18.1	1.2	22.6	1.9	34.4	143	24.0	1.7	29.9	2.6	45.6
27.6	62. 9	16.8	7.0	26.9	8.8	71.6	15.8	11.0	35.8	14.6	109	18.3	1.2	22.9	1.9	34.8	144	24.2	1.7	30.0	2.6	45.9
28.0	64. 1	17.0	7.1	27.4	8.9	72.9	16.0	11.3	36.7	14.8	110	18.5	1.2	23.0	1.9	35.0	145	24.4	1.7	30.3	2.6	46.2
28.6	65. 3	17.4	7.3	28.0	9.1	74.2	16.4	11.5	37.3	15.0	111	18.7	1.2	23.2	1.9	35.3	146	24.6	1.7	30.5	2.6	46.6
29.0	66. 5	17.8	7.4	28.6	9.3	75.6	16.6	11.7	37.8	15.3	112	18.8	1.3	23.4	1.9	35.7	147	24.8	1.7	30.7	2.6	46.9
29.6	67. 7	18.0	7.6	28.9	9.5	76.9	16.8	11.9	38.7	15.7	113	18.9	1.3	23.7	2.0	35.9	148	24.9	1.7	30.9	2.6	47.2
30.0	68. 9	18.3	7.7	29.4	9.7	78.2	17.2	12.0	39.2	15.9	114	19.1	1.3	23.9	2.0	36.3	149	25.0	1.7	31.0	2.6	47.6
																	150	25.2	1.7	31.3	2.6	47.9

LENGTHS OF YARDS, GAFFS, BOOMS, &c.

STEAM-VESSELS, TWO MASTS.

Length on Deck.	AS MAN-OF-WAR.															AS PACKET.											
	MAIN.						FORE.									MAIN.			FORE.								
	Lower.	Arm.	Gaff.	Without Cleats.	Boom.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without Clea s.	Storm-gaff.	Gaff.	Without Cleats.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm	Top-gallant.	Arm.	Gaff.	Without Cleats.	Storm-gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
80	24.4	1.0	17.8	1.4	28.9	13.4	31.2	1.2	24.4	2.0	14.6	.5	17.8	1.4	13.4	13.8	1.3	9.9	27.6	1.1	22.8	1.8	15.6	.6	13.8	1.3	9.9
81	24.8	1.0	17.9	1.4	29.2	13.6	31.7	1.3	24.8	2.0	14.8	.5	17.9	1.4	13.6	13.9	1.3	10.0	27.9	1.1	22.9	1.9	15.8	.6	13.9	1.3	10.0
82	25.0	1.0	18.0	1.4	29.6	13.8	32.0	1.3	25.0	2.0	14.9	.6	18.0	1.4	13.8	14.0	1.3	10.1	28.2	1.1	23.2	1.9	15.9	.6	14.0	1.3	10.1
83	25.4	1.0	18.3	1.4	30.0	13.9	32.4	1.3	25.4	2.1	15.0	.6	18.3	1.4	13.9	14.2	1.4	10.2	28.8	1.1	23.4	1.9	16.0	.6	14.2	1.4	10.2
84	25.8	1.0	18.6	1.4	30.4	14.0	32.8	1.3	25.8	2.1	15.2	.6	18.6	1.4	14.0	14.4	1.4	10.4	29.0	1.1	23.8	1.9	16.2	.6	14.4	1.4	10.4
85	26.0	1.0	18.8	1.4	30.8	14.2	33.0	1.3	26.0	2.1	15.4	.6	18.8	1.4	14.2	14.6	1.4	10.6	29.4	1.2	24.0	2.0	16.4	.6	14.6	1.4	10.6
86	26.4	1.0	18.9	1.5	31.0	14.4	33.5	1.3	26.4	2.1	15.6	.6	18.9	1.5	14.4	14.8	1.4	10.7	29.8	1.2	24.4	2.0	16.6	.6	14.8	1.4	10.7
87	26.8	1.0	19.1	1.5	31.4	14.6	33.9	1.3	26.8	2.1	15.8	.6	19.1	1.5	14.6	14.9	1.4	10.8	30.0	1.2	24.6	2.1	16.9	.6	14.9	1.4	10.8
88	26.9	1.0	19.3	1.5	31.8	14.8	34.2	1.4	27.0	2.2	15.9	.6	19.3	1.5	14.8	15.0	1.4	10.9	30.4	1.2	24.9	2.1	17.0	.6	15.0	1.4	10.9
89	27.2	1.1	19.6	1.5	32.0	14.9	34.7	1.4	27.2	2.2	16.0	.6	19.6	1.5	14.9	15.2	1.5	11.0	30.8	1.2	25.2	2.1	17.2	.6	15.2	1.5	11.0
90	27.6	1.1	19.8	1.5	32.4	15.0	35.0	1.4	27.6	2.2	16.2	.6	19.8	1.5	15.0	15.4	1.5	11.1	31.0	1.2	25.6	2.1	17.4	.7	15.4	1.5	11.1
91	27.9	1.1	20.0	1.5	32.9	15.2	35.4	1.4	27.9	2.2	16.4	.6	20.0	1.5	15.2	15.6	1.5	11.2	31.4	1.2	25.8	2.1	17.6	.7	15.6	1.5	11.2
92	28.2	1.1	20.2	1.6	33.2	15.4	35.9	1.4	28.2	2.3	16.6	.6	20.2	1.6	15.4	15.8	1.5	11.4	31.8	1.3	26.0	2.1	17.8	.7	15.8	1.5	11.4
93	28.4	1.1	20.4	1.6	33.6	15.6	36.2	1.4	28.5	2.3	16.8	.6	20.4	1.6	15.6	15.9	1.5	11.6	32.0	1.3	26.4	2.1	17.9	.7	15.9	1.5	11.6
94	28.8	1.1	20.6	1.6	33.9	15.8	36.6	1.4	28.8	2.3	16.9	.6	20.6	1.6	15.8	16.0	1.5	11.7	32.5	1.3	26.8	2.1	18.1	.7	16.0	1.5	11.7
95	29.0	1.1	20.9	1.6	34.3	15.9	36.9	1.4	29.0	2.3	17.0	.6	20.9	1.6	15.9	16.2	1.6	11.8	32.9	1.3	27.0	2.2	18.4	.7	16.2	1.6	11.8
96	29.4	1.2	21.0	1.6	34.8	16.0	37.4	1.5	29.4	2.4	17.2	.6	21.0	1.6	16.0	16.4	1.6	11.9	33.2	1.3	27.3	2.2	18.6	.7	16.4	1.6	11.9
97	29.8	1.2	21.2	1.6	35.0	16.2	37.8	1.5	29.8	2.4	17.5	.7	21.2	1.6	16.2	16.6	1.6	12.0	33.6	1.3	27.6	2.2	18.8	.7	16.6	1.6	12.0
98	29.9	1.2	21.4	1.6	35.4	16.4	38.0	1.5	29.9	2.4	17.8	.7	21.4	1.6	16.4	16.8	1.6	12.0	33.9	1.4	27.9	2.2	18.9	.7	16.8	1.6	12.0
99	30.0	1.2	21.7	1.7	35.8	16.6	38.5	1.5	30.1	2.4	17.9	.7	21.6	1.7	16.6	16.9	1.6	12.2	34.2	1.4	28.0	2.3	19.0	.7	16.9	1.6	12.2
100	30.4	1.2	21.9	1.7	36.0	16.8	38.9	1.5	30.4	2.5	18.0	.7	21.8	1.7	16.8	17.0	1.6	12.4	34.6	1.4	28.4	2.3	19.2	.7	17.0	1.6	12.4
101	30.8	1.2	22.0	1.7	36.4	16.9	39.4	1.6	30.8	2.5	18.2	.7	22.0	1.7	16.9	17.2	1.6	12.6	34.9	1.4	28.7	2.3	19.4	.7	17.2	1.6	12.6
102	31.0	1.2	22.2	1.7	36.8	17.0	39.8	1.6	31.0	2.5	18.4	.7	22.2	1.7	17.0	17.4	1.7	12.7	35.2	1.4	28.9	2.3	19.6	.7	17.4	1.7	12.7
103	31.4	1.2	22.5	1.7	37.0	17.2	40.0	1.6	31.4	2.5	18.6	.7	22.5	1.7	17.2	17.6	1.7	12.8	35.6	1.4	29.2	2.3	19.9	.7	17.6	1.7	12.8
104	31.8	1.3	22.8	1.7	37.5	17.4	40.5	1.6	31.8	2.6	18.8	.7	22.8	1.7	17.4	17.8	1.7	12.9	35.9	1.4	29.6	2.4	20.0	.8	17.8	1.7	12.9
105	32.0	1.3	23.0	1.7	37.9	17.6	40.9	1.6	32.0	2.6	18.9	.7	23.0	1.7	17.6	17.9	1.7	13.0	36.2	1.4	29.8	2.4	20.2	.8	17.9	1.7	13.0
106	32.4	1.3	23.2	1.7	38.2	17.8	41.2	1.6	32.4	2.6	19.1	.7	23.2	1.7	17.8	18.0	1.7	13.1	36.6	1.4	29.9	2.4	20.4	.8	18.0	1.7	13.1
107	32.8	1.3	23.5	1.7	38.6	17.9	41.7	1.7	32.8	2.6	19.3	.7	23.5	1.7	17.9	18.2	1.7	13.2	36.0	1.4	30.2	2.4	20.6	.8	18.2	1.7	13.2
108	33.0	1.3	23.8	1.7	38.9	18.0	42.0	1.7	33.0	2.6	19.5	.7	23.8	1.7	18.0	18.4	1.7	13.4	37.2	1.5	30.6	2.5	20.8	.8	18.4	1.7	13.4
109	33.2	1.3	24.0	1.8	39.2	18.2	42.4	1.7	33.3	2.7	19.7	.7	24.0	1.7	18.2	18.6	1.8	13.6	37.6	1.5	30.8	2.5	20.9	.8	18.6	1.8	13.6
110	33.6	1.3	24.2	1.8	39.6	18.4	42.8	1.7	33.6	2.7	19.9	.7	24.2	1.8	18.4	18.8	1.8	13.7	37.9	1.5	31.0	2.5	21.0	.8	18.8	1.8	13.7
111	33.8	1.3	24.5	1.8	39.9	18.6	43.1	1.7	33.9	2.7	20.0	.8	24.5	1.8	18.6	18.9	1.8	13.8	38.2	1.5	31.4	2.5	21.3	.8	18.9	1.8	13.8
112	34.0	1.3	24.8	1.8	40.2	18.8	43.6	1.7	34.1	2.7	20.2	.8	24.8	1.8	18.8	19.0	1.8	13.9	38.6	1.5	31.6	2.6	21.6	.8	19.0	1.8	13.9

LENGTHS OF YARDS, GAFFS, BOOMS, &c.

STEAM-VESSELS, TWO MASTS.—(*Continued.*)

Length on Deck.	AS MAN-OF-WAR.															AS PACKET.											
	MAIN.						FORE.									MAIN.			FORE.								
	Lower.	Arm.	Gaff.	Without Cleats.	Boom.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without Cleats.	Storm-gaff.	Gaff.	Without Cleats.	Storm-gaff.	Lower.	Arm.	Top sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without Cleats.	Storm-gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
113	34.4	1.4	24.9	1.8	40.7	18.9	43.9	1.7	34.4	2.8	20.4	.8	24.9	1.8	18.9	19.2	1.8	14.0	38.9	1.5	31.9	2.6	21.8	.8	19.2	1.8	14.0
114	34.8	1.4	25.1	1.8	41.0	19.0	44.3	1.8	34.8	2.8	20.6	.8	25.1	1.8	19.0	19.4	1.8	14.1	39.2	1.5	32.2	2.6	21.9	.8	19.4	1.8	14.1
115	35.0	1.4	25.4	1.8	41.4	19.2	44.8	1.8	35.0	2.8	20.8	.8	25.4	1.8	19.2	19.6	1.8	14.2	39.6	1.6	32.4	2.6	22.1	.8	19.6	1.8	14.2
116	35.4	1.4	25.6	1.8	41.8	19.3	45.0	1.8	35.4	2.9	20.9	.8	25.6	1.8	19.3	19.9	1.8	14.4	39.9	1.6	32.8	2.6	22.4	.8	19.9	1.8	14.4
117	35.8	1.4	25.9	1.8	42.0	19.4	45.5	1.8	35.8	2.9	21.0	.8	25.9	1.8	19.4	20.0	1.8	14.6	40.3	1.6	33.0	2.6	22.6	.8	20.0	1.8	14.6
118	35.9	1.4	26.0	1.8	42.5	19.6	45.9	1.8	36.0	2.9	21.2	.8	26.0	1.8	19.6	20.2	1.8	14.7	40.8	1.6	33.4	2.7	22.8	.9	20.2	1.8	14.7
119	36.2	1.4	26.3	1.8	42.8	19.8	46.2	1.8	36.2	2.9	21.4	.8	26.3	1.8	19.8	20.4	1.8	14.8	41.0	1.6	33.6	2.7	22.9	.9	20.4	1.8	14.8
120	36.6	1.4	26.6	1.9	43.2	19.9	46.7	1.9	36.6	3.0	21.6	.8	26.6	1.8	19.9	20.6	1.8	14.9	41.4	1.6	33.9	2.7	23.0	.9	20.6	1.8	14.9
121	36.8	1.4	26.8	1.9	43.6	20.0	47.0	1.9	36.9	3.0	21.9	.8	26.8	1.9	20.0	20.8	1.8	15.0	41.8	1.6	34.0	2.7	23.2	.9	20.8	1.9	15.0
122	37.2	1.5	27.0	1.9	43.9	20.2	47.4	1.9	37.2	3.0	22.0	.8	27.0	1.9	20.2	20.9	1.8	15.1	42.0	1.7	34.4	2.8	23.4	.9	20.9	1.9	15.1
123	37.6	1.5	27.2	1.9	44.2	20.4	47.9	1.9	37.6	3.0	22.2	.8	27.2	1.9	20.4	21.0	1.9	15.2	42.4	1.7	34.8	2.8	23.7	.9	21.0	1.9	15.2
124	37.9	1.5	27.4	1.9	44.7	20.6	48.1	1.9	37.9	3.0	22.4	.8	27.4	1.9	20.6	21.2	1.9	15.4	42.8	1.7	34.9	2.8	23.9	.9	21.2	1.9	15.4
125	38.1	1.5	27.6	1.9	45.0	20.8	48.5	1.9	38.1	3.1	22.6	.8	27.6	1.9	20.8	21.4	1.9	15.6	43.0	1.7	35.2	2.8	24.0	.9	21.4	1.9	15.6
126	38.4	1.5	27.9	1.9	45.4	20.9	49.0	2.0	38.4	3.1	22.8	.9	27.9	1.9	21.0	21.6	1.9	15.7	43.4	1.7	35.6	2.9	24.2	.9	21.6	1.9	15.7
127	38.8	1.5	28.0	1.9	45.8	21.0	49.4	2.0	38.8	3.1	22.9	.9	28.0	1.9	21.2	21.8	1.9	15.8	43.8	1.7	35.8	2.9	24.4	1.0	21.8	1.9	15.8
128	39.0	1.5	28.3	1.9	46.0	21.2	49.9	2.0	39.0	3.1	23.0	.9	28.3	1.9	21.4	21.9	1.9	15.9	44.0	1.8	36.0	2.9	24.8	1.0	21.9	1.9	15.9
129	39.4	1.5	28.6	1.9	46.4	21.4	50.2	2.0	39.4	3.1	23.2	.9	28.6	1.9	21.6	22.0	1.9	16.0	44.4	1.8	36.4	3.0	24.9	1.0	22.0	1.9	16.0
130	39.8	1.6	28.8	2.0	46.8	21.6	50.7	2.0	39.8	3.2	23.4	.9	28.8	1.9	21.8	22.2	1.9	16.1	44.8	1.8	36.8	3.0	25.0	1.0	22.2	1.9	16.1
131	39.9	1.6	28.9	2.0	47.1	21.8	51.0	2.0	40.0	3.2	23.6	.9	28.9	1.9	21.9	22.4	1.9	16.2	45.0	1.8	36.9	3.0	25.2	1.0	22.4	1.9	16.2
132	40.2	1.6	29.1	2.0	47.6	21.9	51.4	2.1	40.2	3.2	23.9	.9	29.1	2.0	22.0	22.6	1.9	16.4	45.2	1.8	37.2	3.0	25.4	1.0	22.6	1.9	16.4
133	40.6	1.6	29.4	2.0	47.9	22.0	51.8	2.1	40.6	3.2	24.0	.9	29.4	2.0	22.2	22.8	1.9	16.6	45.6	1.8	37.6	3.0	25.6	1.0	22.8	1.9	16.6
134	40.9	1.6	29.6	2.0	48.2	22.2	52.0	2.1	40.9	3.3	24.2	.9	29.6	2.0	22.4	22.9	2.0	16.7	45.9	1.8	37.8	3.0	25.9	1.0	22.9	2.0	16.7
135	41.2	1.6	29.9	2.0	48.6	22.4	52.5	2.1	41.2	3.3	24.4	1.0	29.9	2.0	22.6	23.0	2.0	16.8	46.2	1.9	38.0	3.1	26.0	1.0	23.0	2.0	16.8
136	41.6	1.6	30.0	2.0	48.9	22.6	52.9	2.1	41.6	3.3	24.6	1.0	30.0	2.0	22.8	23.2	2.0	16.9	46.6	1.9	38.4	3.1	26.2	1.0	23.2	2.0	16.9
137	41.9	1.7	30.2	2.0	49.2	22.8	53.2	2.1	41.9	3.3	24.8	1.0	30.2	2.0	22.9	23.4	2.0	17.0	46.9	1.9	38.6	3.1	26.4	1.0	23.4	2.0	17.0
138	42.0	1.7	30.5	2.0	49.6	22.9	53.7	2.1	42.1	3.4	24.9	1.0	30.5	2.0	23.0	23.8	2.0	17.1	47.2	1.9	38.9	3.1	26.6	1.0	23.8	2.0	17.1
139	42.4	1.7	30.8	2.1	49.9	23.0	54.0	2.2	42.4	3.4	25.0	1.0	30.8	2.1	23.0	23.9	2.0	17.2	47.6	1.9	39.2	3.1	26.8	1.0	23.9	2.0	17.2
140	42.8	1.7	30.9	2.1	50.2	23.2	54.4	2.2	42.8	3.4	25.2	1.0	30.9	2.1	23.2	24.0	2.0	17.4	47.9	1.9	39.4	3.1	26.9	1.1	24.0	2.0	17.4
141	43.0	1.7	31.0	2.1	50.6	23.4	54.9	2.2	43.0	3.4	25.4	1.0	31.0	2.1	23.4	24.2	2.1	17.6	48.2	2.0	39.8	3.2	27.0	1.1	24.2	2.1	17.6
142	43.4	1.7	31.2	2.1	50.9	23.6	55.2	2.2	43.4	3.5	25.6	1.0	31.2	2.1	23.6	24.4	2.1	17.7	48.6	2.0	40.0	3.2	27.2	1.1	24.4	2.1	17.7
143	43.7	1.7	31.4	2.1	51.3	23.8	55.7	2.2	43.7	3.5	25.8	1.0	31.5	2.1	23.8	24.6	2.1	17.8	48.9	2.0	40.2	3.2	27.5	1.1	24.6	2.1	17.8
144	43.9	1.7	31.6	2.1	51.8	23.9	56.0	2.2	43.9	3.5	25.9	1.0	31.7	2.1	23.9	24.8	2.1	17.9	49.2	2.0	40.6	3.2	27.8	1.1	24.8	2.1	17.9
145	44.0	1.8	31.8	2.2	52.0	24.0	56.5	2.3	44.1	3.6	26.0	1.0	31.9	2.2	24.0	24.9	2.1	18.0	49.6	2.0	40.9	3.3	27.9	1.1	24.9	2.1	18.0

LENGTHS OF YARDS, GAFFS, BOOMS, &c.

STEAM-VESSELS, TWO MASTS.—(*Continued.*)

Length on Deck.	AS MAN-OF-WAR.															AS PACKET.											
	MAIN.						FORE.									MAIN.			FORE.								
	Lower.	Arm.	Gaff.	Without Cleats.	Boom.	Storm-gaff.	Lower.	Arm.	Top-sail	Arm.	Top-gallant.	Arm.	Gaff.	Without Cleats.	Storm-gaff.	Gaff.	Without Cleats.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without Cleats	Storm-gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
146	44.4	1.8	32.0	2.2	52.4	24.2	56.9	2.3	44.4	3.6	26.2	1.0	32.0	2.2	24.2	25.0	2.1	18.1	49.9	2.0	41.2	3.3	28.0	1.1	25.0	2.1	18.1
147	44.8	1.8	32.2	2.2	52.8	24.4	57.3	2.3	44.8	3.6	26.4	1.0	32.2	2.2	24.4	25.2	2.2	18.2	50.2	2.1	41.4	3.3	28.2	1.1	25.2	2.2	18.2
148	45.0	1.8	32.4	2.3	53.0	24.6	57.8	2.3	45.0	3.6	26.6	1.0	32.4	2.3	24.6	25.4	2.2	18.4	50.6	2.1	41.6	3.3	28.4	1.1	25.4	2.2	18.4
149	45.4	1.8	32.6	2.3	53.4	24.8	58.0	2.3	45.4	3.7	26.8	1.0	32.7	2.3	24.8	25.6	2.2	18.5	50.9	2.1	41.9	3.3	28.6	1.1	25.6	2.2	18.5
150	45.8	1.8	32.8	2.3	53.6	24.9	58.6	2.4	45.8	3.7	26.9	1.0	32.9	2.3	24.9	25.8	2.3	18.6	51.2	2.1	42.2	3.4	28.9	1.1	25.8	2.3	18.6
151	45.9	1.8	33.0	2.3	53.9	25.0	59.8	2.4	45.9	3.7	27.1	1.1	33.0	2.3	25.0	25.9	2.3	18.7	51.6	2.1	42.6	3.4	29.0	1.1	25.9	2.3	18.7
152	46.0	1.8	33.2	2.3	54.2	25.1	60.2	2.4	46.0	3.7	27.4	1.1	33.2	2.3	25.1	26.0	2.3	18.8	52.1	2.1	42.8	3.4	29.2	1.2	26.0	2.3	18.8
153	46.4	1.8	33.4	2.3	54.8	25.2	60.6	2.4	46.4	3.8	27.6	1.1	33.4	2.3	25.2	26.2	2.3	18.9	52.6	2.1	43.0	3.4	29.6	1.2	26.2	2.3	18.9
154	46.8	1.9	33.8	2.3	55.0	25.4	60.9	2.4	46.8	3.8	27.8	1.1	33.8	2.3	25.4	26.4	2.3	19.0	52.9	2.1	43.4	3.5	29.8	1.2	26.4	2.4	19.0
155	47.0	1.9	33.9	2.3	55.4	25.6	61.2	2.5	47.0	3.8	27.9	1.1	33.9	2.3	25.6	26.6	2.3	19.2	53.2	2.1	43.7	3.5	29.9	1.2	26.6	2.4	19.2
156	47.2	1.9	34.0	2.3	55.8	25.8	61.6	2.5	47.2	3.8	28.0	1.1	34.0	2.3	25.8	26.8	2.3	19.4	53.6	2.2	43.9	3.5	30.0	1.2	26.8	2.4	19.3
157	47.6	1.9	34.2	2.3	56.2	25.9	61.9	2.5	47.6	3.9	28.2	1.1	34.2	2.3	25.9	26.9	2.3	19.6	54.0	2.2	44.2	3.6	30.2	1.2	26.9	2.4	19.4
158	47.9	1.9	34.6	2.4	56.6	26.0	62.0	2.5	47.9	3.9	28.4	1.1	34.6	2.3	26.0	27.0	2.3	19.7	54.4	2.2	44.4	3.6	30.4	1.2	27.0	2.4	19.5
159	48.2	1.9	34.8	2.4	56.9	26.2	62.4	2.5	48.2	3.9	28.6	1.1	34.8	2.3	26.2	27.2	2.3	19.8	54.8	2.2	44.6	3.6	30.6	1.2	27.2	2.4	19.6
160	48.6	2.0	34.9	2.4	57.2	26.4	62.8	2.5	48.6	3.9	28.8	1.1	34.9	2.3	26.4	27.6	2.3	19.9	55.0	2.2	44.9	3.6	30.8	1.2	27.4	2.5	19.7
161	48.8	2.0	35.0	2.4	57.6	26.6	63.0	2.5	48.8	4.0	28.9	1.1	35.0	2.3	26.6	27.8	2.4	20.0	55.4	2.2	45.2	3.7	30.9	1.2	27.6	2.5	19.8
162	49.0	2.0	35.2	2.4	58.0	26.8	63.4	2.5	49.0	4.0	29.0	1.1	35.2	2.3	26.8	27.9	2.4	20.1	55.8	2.2	45.4	3.7	31.0	1.2	27.8	2.5	20.0
163	49.4	2.0	35.6	2.4	58.4	26.9	63.8	2.6	49.4	4.0	29.2	1.2	35.6	2.3	26.9	28.0	2.4	20.2	56.0	2.2	45.8	3.7	31.3	1.2	27.9	2.5	20.2
164	49.8	2.0	35.8	2.4	58.8	27.0	64.0	2.6	49.8	4.0	29.4	1.2	35.8	2.3	27.0	28.2	2.4	20.4	56.4	2.3	46.2	3.7	31.6	1.3	28.0	2.5	20.4
165	50.0	2.0	35.9	2.5	59.0	27.2	64.4	2.6	50.0	4.1	29.6	1.2	35.9	2.3	27.2	28.4	2.4	20.6	56.8	2.3	46.6	3.8	31.8	1.3	28.2	2.5	20.5
167	50.2	2.0	36.0	2.5	59.4	27.3	64.8	2.6	50.2	4.1	29.8	1.2	36.0	2.4	27.3	28.6	2.4	20.7	57.2	2.3	46.8	3.8	31.9	1.3	28.5	2.5	20.6
168	50.6	2.0	36.2	2.5	59.8	27.4	65.0	2.6	50.6	4.1	29.9	1.2	36.2	2.4	27.4	28.8	2.4	20.8	57.6	2.3	47.0	3.8	32.0	1.3	28.8	2.6	20.7
169	50.9	2.0	36.6	2.5	60.0	27.6	65.4	2.6	50.9	4.1	30.0	1.2	36.6	2.4	27.6	28.9	2.4	20.9	57.9	2.3	47.4	3.8	32.2	1.3	28.9	2.6	20.8
170	51.2	2.0	36.8	2.5	60.5	27.8	65.8	2.6	51.2	4.1	30.2	1.2	36.8	2.4	27.8	29.0	2.4	21.0	58.2	2.3	47.7	3.9	32.4	1.3	29.0	2.6	20.9
171	51.5	2.1	37.0	2.5	60.9	27.9	66.2	2.7	51.6	4.2	30.4	1.2	37.0	2.4	27.9	29.2	2.5	21.2	58.6	2.3	47.9	3.9	32.8	1.3	29.2	2.6	21.0
172	51.8	2.1	37.2	2.6	61.2	28.0	66.6	2.7	51.9	4.2	30.6	1.2	37.2	2.4	28.0	29.4	2.5	21.4	58.9	2.4	48.2	3.9	32.9	1.3	29.4	2.6	21.1
173	52.0	2.1	37.4	2.6	61.6	28.2	66.9	2.7	52.0	4.2	30.8	1.2	37.4	2.4	28.2	29.6	2.5	21.6	59.2	2 4	48.4	4.0	33.0	1.3	29.6	2.6	21.2
174	52.4	2.1	37.6	2.6	61.9	28.4	67.2	2.7	52.4	4.3	31.0	1.2	37.6	2.5	28.4	29.8	2.5	21.7	59.6	2.4	48.8	4.0	33.2	1.3	29.8	2.6	21.4
175	52.8	2.1	37.8	2.6	62.4	28.6	67.8	2.7	52.8	4.3	31.2	1.2	37.8	2.5	28.6	29.9	2.5	21.9	59.9	2.4	49.0	4.0	33.4	1.3	29.9	2.6	21.5
176	53.0	2.1	38.0	2.6	62.6	28.9	68.0	2.7	53.0	4.3	31.4	1.2	38.0	2.5	28.8	30.0	2.5	22.0	60.2	2.4	49.2	4.0	33.6	1.3	30.0	2.7	21.6
177	53.4	2.1	38.2	2.6	62.9	29.0	68.4	2.8	53.4	4.4	31.6	1.3	38.2	2.5	29.0	30.2	2.6	22.1	60.6	2.4	49.6	4.0	33.8	1.3	30.2	2.7	21.7
178	53.8	2.2	38.6	2.7	63.2	29.2	68.8	2.8	53.8	4.4	31.8	1.3	38.6	2.5	29.2	30.4	2.6	22.2	60.9	2.4	49.9	4.1	34.0	1.3	30.4	2.7	21.8
179	54.0	2.2	38.8	2.7	63.6	29.4	69.0	2.8	54.0	4.4	31.9	1.3	38.8	2.5	29.4	30.6	2.6	22.4	61.2	2.5	50.0	4.1	34.2	1.4	30.6	2.7	21.9
180	54.2	2.2	39.0	2.7	63.8	29.6	69.4	2.8	54.2	4.4	32.0	1.3	39.0	2.5	29.6	30.8	2.6	22.5	61.6	2.5	50.4	4.1	34.4	1.4	30.8	2.7	22.0

LENGTHS OF LOWER-MASTS, TOP-MASTS, &c.

Steam-vessels—Two Masts.

Lengths of Lower-masts, Top-masts, Top-gallant Masts, Bowsprit, and Jib-booms, for Steam-vessels with two Masts.

Breadth.	AS MAN-OF-WAR.														AS PACKET.													
	Main.					Fore.						Bow-sprit.			Main.					Fore.						Bow-sprit.		
	Lower.			Top-mast.		Lower.			Topmast.						Lower.			Topmast.		Lower.			Top-mast.					
	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	To Stops.	Top-gallant Pole.	Sky-sail Pole.	Whole Length.	Housed.	Jib-boom.	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	To Stops.	Top-gallant Pole.	Skysail Pole.	Whole Length	Housed.	Jib-boom.
ft. in.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
15 0	36.2	5.8	8.9	21.8	4.8	31.6	5.8	8.8	16.2	7.4	2.2	15.6	4.8	16.2	28.8	5.8	7.	15.0	3.8	27.2	6.5	7.8	12.9	7.2	2.0	15.2	6.2	14.8
15 6	37.4	5.9	9.0	22.6	5.0	32.6	5.9	9.2	16.8	7.8	2.3	16.0	5.0	16.8	29.8	5.9	8.2	15.6	3.9	28.2	6.7	8.2	13.2	7.4	2.0	15.8	6.4	15.2
16 0	38.7	6.0	9.4	23.4	5.2	33.6	6.2	9.6	17.4	8.0	2.3	16.8	5.2	17.4	30.8	6.0	8.6	16.0	4.0	29.2	6.9	8.6	13.8	7.6	2.1	16.2	6.6	15.8
16 6	39.9	6.2	9.8	24.2	5.4	34.6	6.4	9.8	18.0	8.3	2.4	17.2	5.4	18.0	31.8	6.2	8.8	16.8	4.2	30.0	7.1	8.8	14.0	7.8	2.2	16.8	6.8	16.2
17 0	41.0	6.4	10.0	24.8	5.6	35.6	6.6	10.2	18.6	8.6	2.4	17.8	5.7	18.6	32.8	6.4	9.0	17.2	4.4	31.0	7.4	9.0	14.6	8.0	2.2	17.2	6.9	16.8
17 6	42.3	6.6	10.4	25.6	5.8	36.8	6.8	10.6	19.0	8.9	2.5	18.2	5.9	19.0	33.8	6.6	9.4	17.8	4.6	32.0	7.6	9.4	15.0	8.4	2.3	17.8	7.0	17.2
18 0	43.6	6.9	10.8	26.2	5.9	37.8	6.9	10.8	19.6	9.2	2.6	18.8	6.0	19.6	34.8	6.8	9.6	18.2	4.7	32.9	7.8	9.5	15.6	8.6	2.4	18.2	7.2	17.8
18 6	44.8	7.0	11.0	27.0	6.0	38.8	7.0	11.0	20.0	9.6	2.6	19.2	6.2	20.0	35.7	6.9	9.7	18.8	4.8	33.8	8.0	9.7	15.8	8.9	2.4	18.8	7.4	18.2
19 0	45.9	7.2	11.4	27.9	6.2	39.8	7.2	11.4	20.8	9.8	2.7	19.8	6.4	20.8	36.6	7.0	9.9	19.2	4.8	34.8	8.2	9.9	16.2	9.2	2.5	19.2	7.6	18.8
19 6	47.0	7.4	11.7	28.6	6.4	40.8	7.4	11.8	21.2	10.0	2.7	20.4	6.6	21.2	37.6	7.2	10.2	19.	4.9	35.6	8.5	10.2	16.8	9.4	2.6	19.8	7.8	19.2
20 0	48.3	7.6	11.9	29.2	6.6	41.9	7.6	12.0	21.8	10.4	2.8	20.8	6.8	21.8	38.5	7.6	10.4	20.4	5.0	36.6	8.7	10.4	17.0	9.6	2.6	20.2	7.9	19.8
20 6	49.7	7.8	12.2	30.0	6.7	42.9	7.9	12.2	22.2	10.6	2.8	21.4	6.9	22.2	39.4	7.8	10.8	20.	5.2	37.4	8.9	10.9	17.6	9.8	2.7	20.8	8.0	20.2
21 0	50.9	7.9	12.4	30.8	6.8	44.0	8.0	12.6	22.8	10.8	2.9	21.9	7.0	22.8	40.4	7.9	11.2	21.4	5.3	38.4	9.1	11.2	18.0	10.0	2.8	21.2	8.1	20.8
21 6	52.0	8.2	12.8	31.4	6.9	45.0	8.2	12.9	23.4	11.0	2.9	22.6	7.2	23.4	41.3	8.0	11.6	21.	5.4	39.2	9.3	11.6	18.4	10.2	2.8	21.8	8.2	21.2
22 0	53.2	8.4	13.0	32.2	7.0	46.2	8.4	13.2	24.0	11.4	2.9	23.2	7.4	24.0	42.2	8.4	11.8	22.6	5.6	40.2	9.5	11.8	18.8	10.6	2.9	22.2	8.4	21.8
22 6	54.4	8.6	13.3	32.9	7.2	46.4	8.6	13.4	24.6	11.8	3.0	23.8	7.6	24.6	43.2	8.6	12.0	23.2	5.7	41.2	9.8	12.0	19.2	10.8	2.9	22.8	8.6	22.2
23 0	55.6	8.8	13.6	33.6	7.4	48.4	8.8	13.8	25.0	12.0	3.0	24.2	7.7	25.0	44.1	8.8	12.4	23.8	5.8	41.9	10.0	12.4	19.6	11.0	3.0	23.2	8.8	22.8
23 6	56.9	8.9	13.9	34.4	7.6	48.4	8.9	14.0	25.6	12.2	3.1	24.8	7.9	25.6	45.0	8.9	12.8	24.2	5.9	42.8	10.2	12.8	20.0	11.2	3.0	23.2	8.9	23.2
24 0	58.0	9.0	14.2	35.0	7.8	50.4	9.0	14.4	26.0	12.4	3.2	25.2	8.0	26.0	46.0	9.0	13.0	24.8	6.0	43.8	10.4	13.0	20.6	11.6	3.1	24.2	9.0	23.8
24 6	59.3	9.2	14.6	35.8	7.9	51.4	9.3	14.6	26.8	12.6	3.3	25.8	8.2	26.8	47.0	9.4	13.2	25.2	6.2	44.8	10.6	13.2	21.0	11.8	3.2	24.8	9.2	24.2
25 0	60.5	9.4	14.8	36.6	8.0	52.4	9.6	14.9	27.2	12.8	3.4	26.2	8.4	27.2	47.8	9.6	13.6	25.8	6.4	45.7	10.8	13.6	21.4	12.0	3.3	25.2	9.4	24.8
25 6	61.8	9.8	15.0	37.2	8.2	53.4	9.8	15.2	27.8	13.0	3.	26.8	8.6	27.8	48.8	9.8	13.8	26.2	6.5	46.6	11.1	13.8	21.8	12.2	3.4	25.8	9.6	25.2
26 0	62.9	9.9	15.4	38.0	8.4	54.6	9.9	15.6	28.4	13.4	3.6	27.2	8.8	28.4	49.9	9.9	14.0	26.8	6.6	47.5	11.3	14.0	22.2	12.4	3.5	26.2	9.8	25.8
26 6	64.0	10.0	15.8	38.8	8.6	55.6	10.0	15.9	28.9	13.6	3.7	27.8	8.9	28.9	50.9	10.0	14.4	27.2	6.8	48.4	11.5	14.4	22.6	12.6	3.6	26.8	9.9	26.2
27 0	65.2	10.2	16.0	39.4	8.8	56.6	10.4	16.2	29.4	13.8	3.8	28.2	9.0	29.4	51.8	10.2	14.6	27.8	6.9	49.2	11.7	14.6	23.0	12.8	3.7	27.2	10.0	26.8

LENGTHS OF LOWER-MASTS, TOP-MASTS, &c.

STEAM-VESSELS—TWO MASTS.

Lengths of Lower-masts, Top-masts, Top-gallant Masts, Bowsprit, and Jib-booms, for Steam-vessels with two Masts. (*Continued.*)

Breadth.	AS MAN-OF-WAR.													
	MAIN.					FORE.						BOW-SPRIT.		Jib-boom.
	Lower.			Top-mast.		Lower.			Topmast.					
	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	To Stops.	Top-gallant Pole.	Sky-sail Pole.	Whole Length.	Housed.	
ft. in.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
27 6	66.5	10.4	16.2	40.2	8.9	57.6	10.6	16.2	29.9	14.0	3.9	28.8	9.2	29.8
28 0	67.7	10.6	16.6	41.0	9.0	58.6	10.8	16.8	30.4	14.2	3.9	29.2	9.4	30.4
28 6	68.9	10.8	16.8	41.8	9.2	59.6	10.9	17.0	31.0	14.4	4.0	29.8	9.6	31.0
29 0	70.0	10.9	17.0	42.4	9.4	60.8	11.0	17.4	31.6	14.6	4.1	30.4	9.8	31.6
29 6	71.2	11.0	17.4	43.0	9.6	61.8	11.3	17.6	32.0	14.8	4.2	30.9	9.9	32.0
30 0	72.5	11.3	17.8	43.8	9.7	62.8	11.6	17.9	32.8	15.0	4.3	31.4	10.0	32.8
30 6	73.7	11.6	18.0	44.6	9.8	63.8	11.8	18.2	33.2	15.4	4.4	31.9	10.2	33.2
31 0	74.9	11.8	18.2	45.2	9.9	64.9	11.9	18.6	33.8	15.6	4.5	32.4	10.4	33.8
31 6	76.0	11.9	18.6	46.0	10.0	65.9	12.0	18.9	34.2	15.8	4.6	32.9	10.6	34.2
32 0	77.3	12.0	18.8	46.9	10.2	67.0	12.2	19.2	34.8	16.0	4.7	33.2	10.8	34.9
32 6	78.6	12.2	19.2	47.6	10.4	68.0	12.6	19.6	35.4	16.4	4.8	33.8	10.9	35.4
33 0	79.9	12.4	19.6	48.2	10.6	69.2	12.8	19.8	35.9	16.6	4.9	34.4	11.0	35.9
33 6	81.0	12.6	19.9	49.0	10.8	70.2	12.9	20.0	36.3	16.8	5.0	34.9	11.2	36.3
34 0	82.3	12.9	20.0	49.8	10.9	71.2	13.0	20.4	37.0	17.0	5.1	35.6	11.4	37.0
34 6	83.5	13.0	20.4	50.4	11.0	72.2	13.2	20.7	37.6	17.4	5.2	36.0	11.6	37.6
35 0	84.7	13.2	20.8	51.2	11.2	73.4	13.4	20.9	38.2	17.6	5.3	36.6	11.8	38.2
35 6	85.9	13.4	20.9	52.0	11.4	74.4	13.6	21.2	38.8	17.9	5.4	37.0	11.9	38.8
36 0	87.0	13.6	21.2	52.8	11.6	75.4	13.8	21.6	39.2	18.2	5.5	37.6	12.0	39.2
36 6	88.5	13.8	21.6	53.1	11.8	76.4	14.0	21.8	39.8	18.4	5.6	38.0	12.2	39.8
37 0	89.5	13.9	21.8	54.0	11.9	77.4	14.2	22.0	40.4	18.6	5.7	38.8	12.4	40.4
37 6	90.7	14.2	22.0	54.8	12.0	78.6	14.4	22.4	40.9	18.8	5.8	39.2	12.6	40.9
38 0	91.9	14.4	22.4	55.6	12.2	79.6	14.7	22.8	41.4	19.0	5.9	39.8	12.8	41.4
38 6	93.1	14.6	22.8	56.4	12.4	80.8	14.9	23.0	42.0	19.4	6.0	40.2	12.9	41.8
39 0	94.4	14.8	23.0	57.0	12.6	81.8	15.0	23.4	42.8	19.6	6.1	40.8	13.0	42.8
39 6	95.7	14.9	23.3	57.8	12.8	82.8	15.4	23.7	43.2	19.8	6.2	41.4	13.2	43.2
40 0	96.9	15.0	23.6	58.6	12.9	83.8	15.[illegible]	23.9	43.8	20.0	6.3	41.9	13.4	43.8

Breadth.	AS PACKET.													
	MAIN.					FORE.						BOW-SPRIT.		Jib-boom.
	Lower.			Topmast.		Lower.			Top-mast.					
	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	To Stops.	Top gallant Pole.	Skysail Pole.	Whole Length	Housed.	
ft. in.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
27 6	52.8	10.4	14.8	28.2	7.0	50.2	11.9	14.8	23.4	13.0	3.8	28.8	10.1	27.2
28 0	53.8	10.8	15.0	28.8	7.1	51.2	12.1	15.0	23.9	13.4	3.9	28.2	10.2	27.8
28 6	54.7	10.9	15.4	29.2	7.2	52.2	12.2	15.4	24.4	13.6	3.9	28.8	10.4	28.2
29 0	55.4	11.0	15.6	29.8	7.4	53.0	12.6	15.6	24.8	13.8	4.0	29.2	10.6	28.8
29 6	56.4	11.2	15.8	30.4	7.5	53.8	12.8	15.8	25.2	14.0	4.1	29.8	10.7	29.2
30 0	57.4	11.4	16.0	31.0	7.6	54.8	13.0	16.0	25.8	14.4	4.2	30.2	10.8	29.8
30 6	58.4	11.8	16.4	31.4	7.7	55.8	13.2	16.4	26.0	14.8	4.3	30.8	10.9	30.2
31 0	59.4	11.9	16.6	32.0	7.8	56.6	13.4	16.6	26.4	15.0	4.4	31.2	11.0	30.8
31 6	60.4	12.0	16.8	32.4	7.9	57.6	13.6	16.8	26.9	15.6	4.5	31.8	11.2	31.2
32 0	61.4	12.2	17.0	32.8	8.0	58.6	13.9	17.0	27.2	15.8	4.6	32.2	11.3	31.8
32 6	62.4	12.4	17.4	33.2	8.2	59.5	14.1	17.4	27.8	16.0	4.7	32.8	11.4	32.2
33 0	63.4	12.6	17.6	33.8	8.4	60.4	14.3	17.6	28.0	16.2	4.8	33.2	11.6	32.8
33 6	64.3	12.8	17.8	34.4	8.6	61.2	14.5	17.8	28.6	16.4	4.8	33.8	11.7	33.2
34 0	65.2	13.0	18.2	35.0	8.7	62.2	14.7	18.2	29.0	16.6	4.9	34.2	11.8	33.8
34 6	66.2	13.2	18.4	35.6	8.8	63.0	14.9	18.4	29.5	16.8	4.9	34.8	11.9	34.2
35 0	67.2	13.4	18.6	36.0	8.9	64.2	15.1	18.6	29.9	16.9	5.0	35.2	12.0	34.8
35 6	68.2	13.6	18.8	36.6	9.0	65.0	15.3	18.8	30.2	17.0	5.0	35.8	12.0	35.2
36 0	69.0	13.8	19.0	37.0	9.1	66.0	15.6	19.0	30.8	17.4	5.1	36.2	12.2	35.8
36 6	70.0	13.9	19.2	37.6	9.2	66.9	15.8	19.2	31.2	17.6	5.2	36.8	12.4	36.2
37 0	71.0	14.2	19.6	38.0	9.4	67.8	16.0	19.6	31.6	17.8	5.2	37.2	12.5	36.8
37 6	72.0	14.4	19.8	38.8	9.5	68.6	16.2	19.9	32.0	18.0	5.2	37.8	12.6	37.2
38 0	73.0	14.6	20.2	39.2	9.6	69.6	16.4	20.2	32.4	18.2	5.3	38.2	12.7	37.8
38 6	73.9	14.8	20.6	39.8	9.7	70.6	16.6	20.6	32.8	18.6	5.4	38.8	12.8	38.2
39 0	74.9	14.9	20.8	40.2	9.8	71.4	16.9	20.9	33.2	18.8	5.4	39.2	12.9	38.8
39 6	75.9	15.0	21.2	40.8	9.9	72.4	17.1	21.2	33.8	19.0	5.4	39.8	13.0	39.2
40 0	76.9	15.2	21.6	41.4	10.0	73.2	17.3	21.6	34.0	19.2	5.4	40.2	13.0	39.8

LENGTHS OF YARDS, GAFFS, BOOMS, &c.

Steam-vessels—Three Masts.

Length of Deck.	Main.							Fore.									Mizen.		
	Lower.	Arm.	Top-sail.	Arm.	Gaff.	Without the cleats.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without the cleats.	Storm-gaff.	Gaff.	Boom.	Storm-gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
110	37.0	1.5	23.8	.9	23.0	2.2	15.6	38.4	1.5	32.4	2.6	20.6	.8	26.0	1.6	17.4	19.0	30.0	13.0
111	37.4	1.5	23.9	.9	23.2	2.2	15.7	38.8	1.5	32.7	2.6	20.8	.8	26.3	1.6	17.6	20.0	30.4	13.2
112	37.8	1.5	24.0	.9	23.4	2.2	15.8	39.0	1.5	32.9	2.7	20.	.8	26.6	1.6	17.8	20.2	30.6	13.3
113	38.0	1.5	24.2	.9	23.6	2.2	15.9	39.5	1.6	33.2	2.7	21.0	.8	26.8	1.6	17.9	20.4	30.9	13.4
114	38.4	1.5	24.5	1.0	23.8	2.2	16.0	39.9	1.6	33.6	2.7	21.2	.8	27.0	1.6	18.0	20.6	31.1	13.5
115	38.8	1.5	24.9	1.0	23.9	2.2	16.2	40.2	1.6	33.9	2.7	21.4	.8	27.2	1.7	18.2	20.8	31.4	13.6
116	39.0	1.5	25.0	1.0	24.0	2.2	16.4	40.4	1.6	34.0	2.8	21.6	.8	27.6	1.7	18.3	20.9	31.7	13.7
117	39.4	1.6	25.2	1.0	24.2	2.2	16.6	40.9	1.6	34.4	2.8	21.8	.8	27.9	1.7	18.4	21.0	31.9	13.8
118	39.8	1.6	25.4	1.0	24.5	2.2	16.8	41.2	1.6	34.8	2.8	21.9	.9	28.0	1.7	18.6	21.2	32.0	13.9
119	40.0	1.6	25.6	1.0	24.8	2.3	16.9	41.6	1.7	35.0	2.8	22.0	.9	28.3	1.7	18.7	21.4	32.4	14.0
120	40.4	1.6	25.8	1.0	24.9	2.3	17.0	42.0	1.7	35.3	2.9	22.3	.9	28.6	1.7	18.8	21.6	32.8	14.2
121	40.8	1.6	25.9	1.0	25.0	2.3	17.2	42.4	1.7	35.6	2.9	22.6	.9	28.8	1.7	18.9	21.9	33.0	14.4
122	41.0	1.6	26.0	1.0	25.3	2.3	17.3	42.7	1.7	35.9	2.9	22.8	.9	29.0	1.8	19.0	22.0	33.3	14.5
123	41.4	1.6	26.2	1.0	25.6	2.3	17.4	43.0	1.7	36.2	2.9	22.9	.9	29.5	1.8	19.2	22.2	33.6	14.6
124	41.7	1.7	26.4	1.0	25.8	2.3	17.6	43.4	1.7	36.5	3.0	23.0	.9	29.9	1.8	19.4	22.4	33.9	14.8
125	41.9	1.7	26.6	1.1	26.0	2.3	17.7	43.9	1.7	36.9	3.0	23.2	.9	30.1	1.8	19.6	22.6	34.0	14.9
126	42.3	1.7	26.8	1.1	26.2	2.3	17.8	44.0	1.8	37.0	3.0	23.4	.9	30.4	1.8	19.8	22.8	34.3	15.0
127	42.7	1.7	26.9	1.1	26.4	2.3	17.9	44.4	1.8	37.4	3.1	23.6	.9	30.7	1.8	19.9	22.9	34.6	15.1
128	43.0	1.7	27.0	1.1	26.6	2.4	18.0	44.8	1.8	37.8	3.1	23.8	.9	30.9	1.8	20.0	23.0	34.9	15.2
129	43.4	1.7	27.2	1.1	26.8	2.4	18.2	45.0	1.8	38.0	3.1	24.0	1.0	31.0	1.9	20.2	23.2	35.0	15.4
130	43.8	1.7	27.4	1.1	26.9	2.4	18.4	45.4	1.8	38.3	3.1	24.2	1.0	31.1	1.9	20.4	23.4	35.4	15.6
131	44.0	1.8	27.6	1.1	27.1	2.4	18.6	45.8	1.8	38.6	3.2	24.4	1.0	31.3	1.9	20.6	23.6	35.8	15.7
132	44.4	1.8	27.9	1.1	27.4	2.4	18.7	46.0	1.8	38.	3.2	24.6	1.0	31.5	1.9	20.8	23.9	36.0	15.8
133	44.8	1.8	28.0	1.1	27.6	2.4	18.8	46.4	1.9	39.2	3.2	24.8	1.0	31.7	1.9	20.9	24.0	36.3	15.9
134	45.0	1.8	28.2	1.1	27.8	2.4	18.9	46.8	1.9	39.5	3.2	24.9	1.0	31.9	1.9	21.0	24.2	36.6	16.0
135	45.4	1.8	28.4	1.1	28.0	2.4	19.0	47.0	1.9	39.8	3.3	25.0	1.0	32.0	2.0	21.2	24.4	36.9	16.1
136	45.8	1.8	28.6	1.1	28.2	2.4	19.2	47.5	1.9	40.0	3.3	25.2	1.0	32.1	2.0	21.4	24.6	37.0	16.2
137	46.0	1.8	28.8	1.1	28.4	2.4	19.3	47.9	1.9	40.3	3.3	25.4	1.0	32.3	2.0	21.6	24.8	37.3	16.4
138	46.4	1.9	28.9	1.1	28.6	2.4	19.4	48.2	1.9	40.6	3.3	25.6	1.0	32.5	2.0	21.8	24.9	37.6	16.5
139	46.8	1.9	29.0	1.2	28.9	2.4	19.6	48.6	2.0	40.9	3.3	25.8	1.0	32.7	2.0	21.9	25.0	37.9	16.6
140	47.0	1.9	29.2	1.2	29.0	2.4	19.8	48.9	2.0	41.0	3.4	25.9	1.0	32.9	2.0	22.0	25.2	38.0	16.7
141	47.4	1.9	29.4	1.2	29.2	2.4	19.9	49.2	2.0	41.4	3.4	26.0	1.0	33.0	2.0	22.2	25.4	38.3	16.8
142	47.8	1.9	29.6	1.2	29.4	2.4	20.0	49.6	2.0	41.8	3.4	26.2	1.0	33.2	2.0	22.3	25.6	38.6	16.9
143	48.0	1.9	29.8	1.2	29.7	2.4	20.2	49.9	2.0	42.0	3.4	26.4	1.0	33.4	2.0	22.4	25.8	38.9	17.0
144	48.4	2.0	29.9	1.2	29.9	2.4	20.4	50.2	2.0	42.4	3.5	26.6	1.0	33.6	2.1	22.6	25.9	39.2	17.2
145	48.8	2.0	30.0	1.2	30.0	2.4	20.6	50.6	2.0	42.8	3.5	26.8	1.1	33.9	2.1	22.7	26.0	39.6	17.4
146	49.0	2.0	30.2	1.2	30.2	2.4	20.7	51.0	2.0	43.0	3.5	27.0	1.1	34.0	2.1	22.8	26.2	39.9	17.5
147	49.4	2.0	30.5	1.2	30.4	2.4	20.8	51.5	2.1	43.4	3.5	27.2	1.1	34.2	2.1	22.9	26.4	40.0	17.6
148	49.8	2.0	30.7	1.2	30.6	2.4	20.9	51.9	2.1	43.8	3.6	27.4	1.1	34.4	2.1	23.0	26.6	40.3	17.7
149	50.0	2.0	30.9	1.2	30.9	2.4	21.0	52.0	2.1	44.0	3.6	27.6	1.1	34.6	2.1	23.1	26.8	40.6	17.8
150	50.4	2.0	31.0	1.2	31.0	2.5	21.2	52.4	2.1	44.2	3.6	27.8	1.1	34.8	2.1	23.2	26.9	40.9	17.9
151	50.8	2.0	31.1	1.2	31.2	2.5	21.4	52.8	2.1	44.6	3.6	27.9	1.1	35.0	2.1	23.4	27.1	41.1	18.0
152	51.0	2.0	31.3	1.2	31.4	2.5	21.6	53.0	2.1	44.9	3.7	28.0	1.1	35.2	2.1	23.6	27.4	41.4	18.2
153	51.4	2.1	31.5	1.3	31.6	2.5	21.7	53.4	2.1	45.2	3.7	28.2	1.1	35.4	2.2	23.8	27.6	41.6	18.3
154	51.8	2.1	31.7	1.3	31.9	2.5	21.8	53.8	2.1	45.6	3.7	28.4	1.1	35.6	2.2	23.9	27.8	41.9	18.4
155	52.0	2.1	31.8	1.3	32.0	2.5	21.9	54.0	2.2	45.9	3.7	28.6	1.1	35.8	2.2	24.0	27.9	42.1	18.5
156	52.4	2.1	31.9	1.3	32.3	2.5	22.0	54.4	2.2	46.0	3.8	28.8	1.1	35.9	2.2	24.2	28.0	42.4	18.6
157	52.8	2.1	32.0	1.3	32.6	2.5	22.2	54.8	2.2	46.2	3.8	29.0	1.1	36.0	2.2	24.4	28.2	42.7	18.7
158	53.0	2.1	32.1	1.3	32.9	2.5	22.4	55.0	2.2	46.6	3.8	29.2	1.1	36.3	2.2	24.6	28.4	42.9	18.8
159	53.4	2.1	32.3	1.3	33.0	2.5	22.5	55.4	2.2	46.9	3.8	29.4	1.2	36.6	2.2	24.7	28.6	43.2	[illegible]
160	53.8	2.1	32.5	1.3	33.2	2.5	22.6	55.8	2.2	47.2	3.9	29.6	1.2	36.9	2.2	24.8	28.8	43.6	19.1
161	54.0	2.2	32.7	1.3	33.4	2.5	22.7	56.0	2.2	47.5	3.9	29.8	1.2	37.0	2.2	24.9	28.9	43.8	19.2
162	54.4	2.2	32.8	1.3	33.6	2.5	22.8	56.5	2.2	47.8	3.9	29.9	1.2	37.3	2.3	25.0	29.0	44.0	19

LENGTHS OF YARDS, GAFFS, BOOMS, &c. (*Continued.*)

STEAM-VESSELS—THREE MASTS.

[Fig. 24, Pl. I.

Length of Deck.	MAIN.							FORE.									MIZEN.		
	Lower.	Arm.	Top-sail.	Arm.	Gaff.	Without the cleats.	Storm-gaff.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.	Without the cleats.	Storm-gaff	Gaff.	Boom.	Storm-gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
163	54.8	2.2	32.9	1.3	33.8	2.5	22.9	56.9	2.2	48.0	4.0	30.0	1.2	37.6	2.3	25.2	29.2	44.4	19.4
164	55.0	2.2	33.1	1.3	33.9	2.5	23.0	57.2	2.2	48.2	4.0	30.2	1.2	37.9	2.3	25.4	29.4	44.8	19.5
165	55.4	2.2	33.3	1.3	34.2	2.5	23.1	57.6	2.3	48.6	4.0	30.4	1.2	38.0	2.3	25.6	29.6	45.0	19.6
166	55.8	2.2	33.6	1.3	34.5	2.5	23.2	57.9	2.3	48.9	4.0	30.6	1.2	38.3	2.3	25.8	29.8	45.3	19.7
167	56.0	2.2	33.9	1.3	34.8	2.5	23.3	58.2	2.3	49.1	4.1	30.9	1.2	38.6	2.3	25.9	29.9	45.6	19.8
168	56.4	2.2	34.0	1.3	35.0	2.5	23.4	58.6	2.3	49.4	4.1	31.0	1.2	38.9	2.3	26.0	30.0	45.9	19.9
169	56.8	2.2	34.3	1.3	35.2	2.5	23.5	59.0	2.3	49.8	4.1	31.2	1.2	39.0	2.4	26.2	30.2	46.0	20.0
170	57.0	2.3	34.6	1.4	35.5	2.5	23.6	59.3	2.3	50.0	4.1	31.4	1.2	39.3	2.4	26.4	30.4	46.2	20.2
171	57.4	2.3	34.8	1.4	35.8	2.6	23.7	59.8	2.3	50.2	4.2	31.6	1.2	39.6	2.4	26.6	30.6	46.5	20.4
172	57.8	2.3	34.9	1.4	36.0	2.6	23.8	60.1	2.4	50.5	4.2	31.8	1.3	39.9	2.4	26.8	30.8	46.8	20.5
173	58.0	2.3	35.0	1.4	36.3	2.6	24.0	60.6	2.4	50.8	4.2	31.9	1.3	40.0	2.4	26.9	31.0	47.0	20.6
174	58.4	2.3	35.3	1.4	36.5	2.6	24.2	61.0	2.4	51.1	4.2	32.0	1.3	40.3	2.4	27.0	31.2	47.2	20.7
175	58.8	2.3	35.6	1.4	36.8	2.6	24.4	61.6	2.4	51.4	4.2	32.2	1.3	40.6	2.4	27.2	31.4	47.6	20.8
176	59.0	2.4	35.9	1.4	36.9	2.6	24.6	62.0	2.5	51.8	4.2	32.4	1.3	40.9	2.4	27.4	31.6	47.9	21.0
177	59.4	2.4	36.3	1.4	37.0	2.6	24.8	62.6	2.5	52.0	4.3	32.6	1.3	41.0	2.5	27.6	31.8	48.0	21.1
178	59.8	2.4	36.9	1.4	37.2	2.6	24.9	62.9	2.5	52.3	4.3	32.8	1.3	41.3	2.5	27.8	31.9	48.8	21.2
179	60.0	2.4	37.0	1.5	37.4	2.6	25.0	63.3	2.5	52.6	4.3	32.9	1.3	41.6	2.5	27.9	32.0	48.9	21.3
180	60.4	2.4	37.6	1.5	37.6	2.6	25.6	63.6	2.5	53.0	4.3	33.0	1.3	41.9	2.5	28.0	32.2	49.0	21.4
181	60.8	2.4	37.8	1.5	37.8	2.6	25.6	63.8	2.6	53.0	4.3	33.2	1.3	42.0	2.5	28.2	32.4	49.2	21.2
182	61.0	2.5	38.2	1.5	37.9	2.6	25.8	64.0	2.6	53.2	4.3	33.4	1.3	42.4	2.5	28.4	32.5	49.4	21.4
183	61.4	2.5	38.6	1.5	38.0	2.6	25.9	64.2	2.6	53.4	4.3	33.6	1.3	42.8	2.5	28.6	32.6	49.6	21.6
184	61.8	2.5	38.8	1.5	38.2	2.6	26.0	64.4	2.6	53.8	4.4	33.8	1.3	42.9	2.5	28.7	32.8	49.8	21.7
185	61.9	2.5	39.0	1.6	38.4	2.6	26.1	64.6	2.6	53.9	4.4	33.9	1.3	43.2	2.5	28.8	32.9	49.9	21.8
186	62.0	2.5	39.4	1.6	38.6	2.6	26.2	64.8	2.6	54.2	4.4	34.0	1.3	43.4	2.5	28.9	33.0	50.0	21.9
187	62.4	2.5	39.6	1.6	38.8	2.7	26.4	65.0	2.6	54.4	4.5	34.2	1.4	43.6	2.6	29.0	33.2	50.2	22.0
188	62.8	2.5	39.8	1.6	38.9	2.7	26.6	65.4	2.6	54.9	4.5	34.4	1.4	43.8	2.6	29.1	33.6	50.4	22.2
189	63.0	2.5	39.9	1.6	39.0	2.7	26.7	65.8	2.6	55.2	4.5	34.6	1.4	44.0	2.6	29.2	33.8	50.6	22.4
190	63.4	2.5	40.0	1.6	39.2	2.7	26.8	66.0	2.7	55.4	4.5	34.8	1.4	44.2	2.6	29.4	33.9	50.8	22.6
191	63.8	2.6	40.2	1.6	39.4	2.7	26.9	66.4	2.7	55.8	4.6	34.9	1.4	44.6	2.6	29.6	34.0	51.0	22.7
192	64.0	2.6	40.4	1.6	39.6	2.7	27.0	66.8	2.7	56.0	4.6	35.0	1.4	44.8	2.6	29.8	34.2	51.4	22.8
193	64.4	2.6	40.6	1.6	39.9	2.7	27.2	67.0	2.7	56.4	4.6	35.2	1.4	44.9	2.7	29.9	34.4	51.8	22.9
194	64.8	2.6	40.8	1.6	40.0	2.7	27.4	67.6	2.7	56.6	4.6	35.4	1.4	45.0	2.7	30.0	34.6	51.9	23.0
195	65.0	2.6	40.9	1.7	40.2	2.7	27.6	67.9	2.7	56.9	4.7	35.8	1.4	45.4	2.7	30.1	34.8	52.2	23.1
196	65.4	2.6	41.0	1.7	40.4	2.7	27.7	68.2	2.7	57.2	4.7	35.9	1.4	45.6	2.7	30.2	34.9	52.6	23.2
197	65.8	2.6	41.2	1.7	40.6	2.7	27.8	68.6	2.8	57.4	4.7	36.0	1.4	45.8	2.7	30.4	35.0	52.9	23.4
198	66.0	2.7	41.4	1.7	40.8	2.7	27.9	68.9	2.8	57.8	4.7	36.2	1.4	46.0	2.8	30.6	35.2	53.2	23.5
199	66.4	2.7	41.6	1.7	40.9	2.7	28.0	69.2	2.8	57.9	4.8	36.4	1.4	46.2	2.8	30.7	35.4	53.4	23.6
200	66.8	2.7	41.8	1.7	41.0	2.8	28.1	69.6	2.8	58.4	4.8	36.6	1.5	46.4	2.8	30.8	35.6	53.8	23.7
201	67.0	2.7	42.4	1.7	41.2	2.8	28.2	69.9	2.8	58.8	4.8	36.8	1.5	46.6	2.8	30.9	35.8	54.0	23.8
202	67.4	2.7	42.6	1.7	41.4	2.8	28.4	70.2	2.8	59.0	4.8	36.9	1.5	46.9	2.8	31.0	35.9	54.2	23.9
203	67.8	2.7	42.8	1.7	41.6	2.8	28.6	70.6	2.8	59.4	4.8	37.2	1.5	47.0	2.8	31.2	36.0	54.6	24.0
204	68.0	2.7	42.9	1.7	41.8	2.8	28.7	70.9	2.9	59.8	4.9	37.4	1.5	47.2	2.9	31.4	36.1	54.9	24.2
205	68.2	2.7	43.0	1.7	41.9	2.8	28.8	71.4	2.9	59.9	4.9	37.6	1.5	47.4	2.9	31.5	36.2	55.2	24.4
206	68.4	2.8	43.4	1.7	42.0	2.8	28.9	71.8	2.9	60.0	4.9	37.8	1.5	47.8	2.9	31.6	36.4	55.6	24.6
207	68.8	2.8	43.6	1.7	42.2	2.8	29.0	72.2	2.9	60.2	5.0	37.9	1.5	47.9	2.9	31.7	36.6	55.8	24.7
208	69.0	2.8	43.8	1.8	42.4	2.8	29.2	72.6	2.9	60.6	5.0	38.0	1.5	48.0	2.9	31.8	36.8	56.0	24.8
209	69.4	2.8	43.9	1.8	42.6	2.9	29.4	72.9	2.9	60.9	5.0	38.2	1.5	48.2	2.9	32.0	36.9	56.4	24.9
210	69.7	2.8	44.0	1.8	42.8	2.9	29.6	73.2	2.9	61.2	5.0	38.4	1.5	48.4	2.9	32.2	37.0	56.8	25.0
211	70.0	2.8	44.2	1.8	42.9	2.9	29.7	73.6	3.0	61.6	5.1	38.6	1.5	48.8	3.0	32.4	37.2	57.0	25.2
212	70.4	2.8	44.4	1.8	43.0	2.9	29.8	73.9	3.0	61.9	5.1	38.8	1.5	48.9	3.0	32.6	37.4	57.4	25.4
213	70.8	2.9	44.6	1.8	43.2	2.9	29.9	74.4	3.0	62.2	5.1	38.9	1.5	49.0	3.0	32.8	37.6	57.8	25.6
214	71.0	2.9	44.8	1.8	43.4	2.9	30.0	74.8	3.0	62.6	5.1	39.0	1.5	49.2	3.0	32.9	37.8	58.0	25.7
215	71.4	2.9	45.0	1.8	43.6	2.9	30.2	75.0	3.0	62.9	5.2	39.2	1.6	49.6	3.0	33.0	37.9	58.4	25.8

LENGTHS OF LOWER-MASTS, TOP-MASTS, TOP-GALLANT-MASTS, BOWSPRITS, JIB-BOOMS, AND FLYING JIB-BOOMS.

Steam-vessels—Three Masts.

[Fig. 24, Pl. I.

Breadth.	Lower-masts.									Top-masts.									
	Main.			Fore.			Mizen.			Main.		Fore.			Mizen.		Bowsprit.		
	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	To Stops.	Pole.	To Stops.	Top-gallant Pole.	Sky-sail Pole.	To Stops.	Pole.	Whole Length.	Housed.	Jib-boom.
20.0	50.8	8.9	12.2	42.8	8.4	12.2	41.8	6.0	11.2	31.6	6.0	24.4	11.6	4.8	23.0	4.2	26.2	7.6	24.8
20.6	52.0	9.0	12.4	44.0	8.6	12.4	42.9	6.2	11.6	32.4	6.2	24.8	11.9	5.0	23.6	4.4	26.8	7.8	25.6
21.0	53.4	9.2	12.8	45.0	8.8	12.8	43.9	6.4	11.8	33.2	6.4	25.6	12.2	5.2	24.0	4.6	27.4	7.9	26.0
21.6	54.6	9.4	13.0	46.0	9.0	13.0	44.8	6.6	12.0	34.0	6.6	26.0	12.6	5.2	24.6	4.6	28.0	8.0	26.8
22.0	55.9	9.6	13.2	47.0	9 2	13.2	46.0	6.8	12.4	34.8	6.8	26.8	12.8	5.4	25.2	4.8	28.8	8.2	27.4
22.6	57.2	9.8	13.6	48.0	9.4	13.6	47.0	6.9	12.8	35.8	6.9	27.4	13.0	5.6	25.8	4.9	29.4	8.4	28.0
23.0	58.4	10.0	14.0	49.2	9.8	14.0	48.0	7.0	13.0	36.2	7.0	27.8	13.4	5.6	26.4	5.0	30.2	8.8	28.9
23.6	59.8	10.4	14.2	50.4	9.9	14.2	49.0	7.2	13.2	37.2	7.2	28.6	13.8	5.8	27.0	5.0	30.7	8.9	29.4
24.0	61.0	10.6	14.4	52.4	10.0	14.4	50.0	7.4	13.6	37.8	7.4	29.2	14.0	5.9	27.6	5.2	31.2	9.0	29.8
24.6	62.0	10.8	14.8	52.4	10.2	14.8	51.0	7.6	13.8	38.6	7.6	29.8	14.2	6.0	28.0	5.2	32.0	9.2	30.6
25.0	63.6	11.0	15.0	53.6	10.4	15.0	52.0	7.8	14.0	39.6	7.8	30.4	14.6	6.0	28.8	5.4	32.8	9.4	31.0
25.6	64.8	11.2	15.4	54.6	10.8	15.4	53 0	7.9	14.4	40.4	7.9	30.8	14.9	6.2	29.2	5.6	33.4	9.6	31.5
26.0	66.0	11.6	15.8	55.8	10.9	15.8	54.0	8.0	14.8	41.0	8.0	31.6	15.4	6.4	29.8	5.6	34.0	9.8	32.4
26.6	67.0	11.8	16.0	56.0	11.0	16.0	55.2	8.0	15.0	41.8	8.1	32.0	15.6	6.6	30.4	5.8	34.6	9.9	32.8
27.0	68.4	11.9	16.4	57.8	11.2	16.4	56.2	8 2	15.4	42.6	8.2	32.8	15.8	6.6	30.	5.9	35.4	10.1	33.6
27.6	69.8	12.0	16.8	58.9	11.6	16.8	57.2	8.4	15.6	43.4	8.4	33.4	16.0	6.8	31.6	6.0	35.9	10 4	34.2
28.0	71.0	12.4	17.0	59.8	11.8	17.0	58.4	8.6	15.8	44.2	8.6	33.8	16.4	6.9	32.0	6.1	36.4	10.6	34.8
28.6	72.4	12.6	17.4	61.0	12.0	17.4	59.4	8.8	16.0	45.8	8.8	34.6	16.6	7.0	32.8	6.2	37.0	10.8	35.6
29.0	73.0	12.8	17.8	62.0	12.2	17.8	60.6	8.9	16.4	46.0	8.9	35.2	16.8	7.0	33.2	6.4	38.8	10.9	36.0
29.6	74.9	12.9	17.9	63.2	12.4	18.0	61.6	9.0	16.8	46.6	9.0	35.8	17.0	7.2	33.8	6.4	38 6	11.0	36.8
30.0	76.0	13.0	18.2	64.0	12.6	18.2	62.6	9.2	17 0	47.4	9.2	36.4	17.4	7.4	34 4	6.6	39.0	11.2	37.4
30.6	77.4	13.2	18.6	65.4	12.8	18.6	63.8	9.4	17.4	48.2	9.4	37.0	17.8	7.6	35 0	6.6	39.8	11.4	38.0
31.0	78.6	13.6	18.9	66.4	13.0	18.9	64.8	9.6	17.8	48.8	9.6	37.6	18.0	7.7	35.6	6.8	40.4	11.6	38.5
31.6	79.9	13.8	19.2	67.6	13.2	19.2	65.8	9.6	17.9	49.8	9.6	38.0	18.2	7.8	36.0	6.8	41.0	11.8	39.4
32.0	81.2	13.9	19.6	68.4	13.4	19.6	66.6	9.8	18.0	50.6	9.8	38.8	18.6	7.9	36.8	6.9	41.8	12.0	40.0
32.6	82.4	14.0	19.9	69.8	13.6	19.9	67.8	9.9	18.4	51.2	9.9	39.4	18.8	8.0	37.4	6.9	42.4	12.2	40.5
33.0	83.7	14.4	20.2	70.8	13.8	20.2	68.8	10.0	18.8	52.0	10.0	40.0	19.2	8.1	37.8	7.0	43.0	12.6	41.2
33.6	85.0	14.6	20.6	71.8	14.0	20.6	70.0	10.2	19.0	52.8	10.2	40.6	19.4	8.2	38.6	7.2	43.8	12.8	41.6
34.0	86.4	14.8	20.8	72.8	14.2	20.9	71.0	10.4	19.4	53.6	10.4	41.2	19.6	8.4	39.2	7.4	44.4	12.9	42.4
34.6	87.6	15.0	21.2	73.8	14.4	21.2	72.0	10.6	19.6	54.4	10.6	41.8	19.8	8.6	39.8	7.4	45.0	13.0	43.0
35.0	88.8	15.6	21.6	75.0	14.6	21.6	73.0	10.7	19.8	55.2	10.7	42.4	20.2	8.7	40.2	7.6	45.8	13.2	43.8
35.6	90.0	15.8	21.8	76.0	14.8	21.8	74.0	10.8	20.0	56.0	10.8	43.0	20.6	8.8	40.8	7.8	46.4	13.4	44.4
36.0	91.4	15.9	22.0	77.2	15.0	22.0	75.0	10.9	20.4	56.8	10.9	43.6	20.8	8.9	41.6	7.8	46.8	13 6	45.0
36.6	92.8	16.0	22.2	78.0	15.2	22.2	76.0	11.0	20.8	57.4	11.0	44.4	21.0	9.0	42.0	7.9	47.6	13.8	45.6
37.0	94.0	16.2	22.4	79.2	15.4	22.4	77.0	11.2	21.0	58.4	11.2	44.8	21.4	9.0	42.8	7.9	48.2	13.9	46.2
37.6	95.2	16.4	22.8	80.2	15.8	22.8	78.2	11.4	21.4	59.2	11.4	45.6	21.8	9.2	43.2	8.0	48.8	14.0	46.8
38.0	96.6	16.8	23.0	81.2	16.0	23.0	79.2	11.6	21.6	59.8	11.6	46.0	22.0	9.4	43.8	8.2	49.6	14.2	47.6
38.6	97.8	16.9	23.4	82.4	16.2	23.4	80.4	11.8	21.8	60.8	11.8	46.8	22.2	9.4	44.4	8.4	50.4	14.4	48 2
39.0	98.9	17.0	23.8	83.4	16.4	23.8	81.8	11.9	22.0	61.6	11.9	47.4	22.6	9.6	45.0	8.4	50.1	14.4	48.8
39.6	100.4	17.4	24.0	84.4	16.6	24.0	82 4	12.0	22.4	62.4	12.0	47.8	22.9	9.8	45 6	8.6	51.6	14.8	49.4
40.0	101.6	17.6	24.4	85.6	16.8	24.4	83.4	12.2	22.8	63.0	12.2	48.6	23.2	9.9	46.0	8.6	52.0	14.9	50.0
40.6	102.8	17.8	24.8	86.6	17.0	24.8	84.6	12.4	23.0	64.0	12.4	49.2	23.6	10.0	46.8	8.8	52.8	15 0	50 6
41.0	104.2	17.9	25.0	87.8	17.2	25.0	85.6	12.6	23.4	64.8	12.6	49.8	23.8	10.0	47.4	8.8	53.4	15.2	51.2
41.6	105.4	18.0	25.4	88.6	17.4	25.4	86.6	12.8	23.6	65.6	12.8	50.4	24.0	10.2	48.0	8.9	54.0	15.4	51.8
42.0	106.6	18.4	25.8	89.8	17.6	25.6	87.6	12.9	23.8	66.2	12.9	50.8	24 4	10.4	48.4	8.9	54.8	15.6	52.6
42.6	107.9	18.6	26.0	90.8	17.8	25.9	88.6	13.0	24.0	67.2	13.0	51.6	24.8	10.6	49.0	9.0	55.6	15.8	53.2
43.0	109.2	18.9	26.2	92.0	18.0	26.2	89.6	13.2	24 4	67.8	13.2	52.0	25.0	10.7	49.8	9.2	56.0	15.9	53.8
43.6	110.6	19.0	26.4	93.2	18.2	26.4	90.1	13.4	24.8	68.8	13.4	52 8	25.2	10.8	50.2	9.2	56.8	16.0	54.4
44 0	111.8	19.2	26.8	94.0	18.6	26.8	91.8	13.6	25.0	69.4	13.6	53.4	25.6	10.9	50.8	9.4	57.4	16.2	54.8
44.6	113.0	19.6	27.0	95.2	18.8	27.0	92.9	13.8	25.4	70.4	13.8	54.0	25.8	11.0	51.6	9.6	58.0	16.4	55.6
45.0	114.2	19 8	27.4	96.2	18.9	27.4	93.8	13.9	25.6	71.0	13.9	54.8	26.	11.2	51.	9.8	58.8	16.6	55.2

ON THE MASTING OF MERCHANT SHIPS.

In determining the masts for merchant ships, no general rule appears to have been observed, as we find many ships in the same trade, and of the same dimensions, with very different masts and yards; and which, from their form and general cargo, would appear to have about the same stability, and consequently require the same number of men to work them.

This in some measure may be accounted for, by the masting of these ships being often left to be determined by the idea of the persons who are to sail them,—sometimes to the owner, and at other times to the builder. This has produced not only a great difference in the dimensions of masts and yards for similar ships, but as great a variety in the degrees of squareness and tauntness of the rig; while to produce the best effects, the same regard should be paid to established principles as in the rules laid down for masting ships of war. In comparing the dimensions of masts and yards of merchant ships with those given to ships of war, we find that instead of the merchant ships, (though requiring fewer men to work them, and not needing to sail with the same speed,) having less mast and yards, it is frequently the case that they carry a greater quantity of sail than ships of war, in relation to their principal dimensions; as may be seen in one or two of the examples given. In forming the rules by which the dimensions of the masts and yards have been determined, in the Tables for Merchant Ships, such examples only have been taken as were derived from the most approved rig. Some of the drawings which are given in Plates I. and II., vary in squareness and tauntness, so that such dimensions may be taken as may be considered the most suitable for their employments, and for the number of men they have to work them.

Proportions for the Lengths of Masts, Yards, &c., of Merchant Vessels. (T. I.

SPECIES OF MASTS AND GEAR.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.														
		Ships.			Barques.		Brigs.		Steam-Vessels.				Merchant Vessels.		
										With two Masts.					
		First Example.	Second Example.	Third Example.	First Example.	Second Example.	First Example.	Second Example, as Collier Brig.	With three Masts.	As Man-of-War.	As Packet.	With stump Masts.	Brigantine	Schooner.	Sloops with one Mast.
Main-mast hounded	Breadth ×	2.02	1.956	1.945	2.196	2.	2.088	1.81	2.54	2.42	1.92	2.29	2.8	2.57	2.826
Main-mast headed	Hounded length ×	.2	.2	.2	.2	.199	.2	.2	.173	.155	.196	.11	.126	.164	.2154
Fore-mast hounded	Main-mast hounded ×	.899	.9	.933	.9	.948	.933	.934	.845	.875	.953	1.14	.783	.961	—
Fore-mast headed	Hounded length ×	.2	.2	.2	.2	.2	.2	.177	.196	.182	.236	Pole. .158	.144	.174	—
Mizen-mast hounded	Main-mast hounded ×	.835	.8362	.843	.732	.992	—	—	.823	—	—	—	—	—	—
Mizen-mast headed	Hounded length ×	.161	.161	.162	.16	.16	—	—	.14	—	—	—	—	—	—
Main-top-mast hounded	Breadth ×	1.29	1.21	1.18	1.256	1.147	1.186	.974	1.58	1.46	1.03	.98	.8	1.31	1.923
Main-top-mast headed	Hounded length ×	.1625	.1617	.16	.16	.16	.163	.191	—	—	—	—	—	—	—
Main-top-mast pole-head	Hounded length ×	—	—	—	—	—	—	—	.1934	.221	.242	.33	.87	.213	.174
Fore-top-mast hounded	Main-top-mast hounded ×	.903	.9	.982	.9	.945	.933	1.	.77	.743	.83	—	.4	.71	—
Fore-top-mast headed	Hounded length ×	.161	.1626	.161	.16	.16	.163	.191	—	—	—	—	—	—	—
Mizen-top-mast hounded	Main-top-mast hounded ×	.662	.6307	.735	.864	.89	—	—	.726	—	—	—	—	—	—
Mizen-top-mast headed	Hounded length ×	.141	.1436	.143	—	—	—	—	—	—	—	—	—	—	—
Mizen top-mast pole-head	Hounded length ×	—	—	—	.26	.247	—	—	.188	—	—	—	—	—	—
Main-top-gallant-mast hounded	Breadth ×	.64	.616	.564	.736	.757	.725	.566	—	—	—	—	—	—	—
Main-top-gallant-mast headed	Hounded length ×	.143	.143	.143	—	—	.142	—	—	—	—	—		—	—
Main-top-gallant-mast pole-head	Hounded length ×	—	—	—	.837	.81	—	—	—	—	—	—		—	—
Fore-top-gallant-mast hounded	Main-top-gal.-mt. hound ×	.9	.9	.99	.9	.95	.953	1.	—	—	—	—	Fore top-mast .5	—	—
Fore-top-gallant-mast headed	Hounded length ×	.146	.144	.14	—	—	.142	—	—	—	—	—	—	—	—
Fore-top-gallant pole	Fore-top-mast hounded ×	—	—	—	.488	.51	—	—	.478	.477	.56	—	—	.5	—
Fore-top-gallant-sky-sail pole	Fore-top-gallant pole ×	—	—	—	—	—	—	—	.425	.27	.3	—	—	.35	—
Mizen-top-gallant-mast hounded	Main-top-gal.-mt.hound. ×	.65	.616	.8	—	—	—	—	—	—	—	—	—	—	—
Mizen-top-gallant-mast headed	Hounded length ×	.143	.155	.144	—	—	—	—	—	—	—	—	—	—	—
Main-royal-mast hounded	Breadth ×	.426	.39	.374	—	—	—	.376	—	—	—	—	—	—	—
Main-royal-mast pole	Hounded length ×	.166	—	.186	—	—	—	.25	—	—	—	—	—	—	—
Main-gunter-masts hounded	Breadth ×	—	—	—	—	—	.94	—	—	—	—	—	—	—	—
Main-gunter-masts pole	Hounded length ×	—	—	—	—	—	.144	—	—	—	—	—	—	—	—
Fore-gunter-mast hounded	Main-gunter-mt. hound. ×	—	—	—	—	—	.935	—	—	—	—	—	—	—	—
Fore-gunter-mast pole	Hounded length ×	—	—	—	—	—	.144	—	—	—	—	—		—	—
Fore-royal-mast hounded	Main-royal-mt. hounded ×	.926	.9	.99	—	—	—	1.	—	—	—	—		—	—
Fore-royal-mast pole	Hounded length ×	.17	—	.187	—	—	—	.25	—	—	—	—	Fore top-gall. .68	—	—
Mizen-royal-mast hounded	Main-royal-mt hounded ×	.67	.621	.769	—	—	—	—	—	—	—	—	—	—	
Mizen-royal-mast pole	Hounded length ×	.163	—	.225	—	—	—	—	—	—	—	—	—	—	
Bowsprit	Fore-mast hounded ×	.801	.753	.781	.726	.7	.707	.735	.6	.5	.574	.5	.57	.623	Top-mast hounded. 1.
Jib-boom	Bowsprit ×	.708	.71	.725	.86	.919	1.	.91	.936	1.04	.976	—	1.02	.91	—
Flying-jib-boom	Jib-boom ×	.402	1.08	.99	.086	.33	1.11	.083	—	—	—	—	—	—	—
Flying-jib-boom pole	Flying-jib-boom ×	—	—	—	—	—	.095	—	—	—	—	—	—	—	—
Main-lower-yard	Length ×	.527	.519	.515	.5	.539	.501	.5	.336	.305	—	—	.527	—	—
Main-lower-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	.041	.041	—	—	—	—	—
Main-top-sail-yard	Main-yard ×	.722	.691	.705	.755	.773	.77	.814	.625	—	—	—	.655	—	—
Main-top-sail-yard-arm	Length of yard ×	.083	.083	.083	.083	.083	.083	.083	.041	—	—	—	—	—	—

Proportions for the Lengths of Masts, Yards, &c., of Merchant Vessels.—(Continued.)

SPECIES OF MASTS AND GEAR.	KNOWN QUANTITIES.	PROPORTIONS IN TERMS OF KNOWN QUANTITIES.—(*Continued.*)													
		Ships.			Barques.		Brigs.		Steam Vessels.				Merchant Vessels.		
									With three Masts.	With two Masts.					
		First Example.	Second Example.	Third Example.	First Example.	Second Example.	First Example.	Second Example, as Collier Brig.		As Man-of-War.	As Packet.	With stump Masts.	Brigantine.	Schooner.	Sloops with one Mast.
Main-top-gallant-yard	Main-top-sail-yard ×	.676	.632	.67	.6425	.648	.683	.7	—	—	—	—	.71	—	—
Main-top-gallant-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	—	—	—	—	—	—	—
Main-royal-yard	Main-top-gallant-yard ×	.768	.71	.747	.75	.724	.77	.796	—	—	—	—	—	—	—
Main-royal-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	—	—	—	—	—	—	—
Fore-lower-yard	Main-yard ×	.902	.9	.953	.9	.947	.93	1.	1.04	1·28	—	—	1.	—	—
Fore-lower-yard	Length ×	—	—	—	—	—	—	—	—	—	.345	—	—	.55	—
Fore-lower-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	.041	·041	.041	—	.041	.041	—
Fore-top-sail-yard	Main-top-sail-yard ×	.9	.9	.936	.9	.95	.983	1.	1.4	·7825	—	—	1.28	—	—
Fore-top-sail-yard	Fore-lower-yard ×	—	—	—	—	—	—	—	—	—	.823	—	—	.82	—
Fore-top-sail-yard-arm	Length of yard ×	.083	.083	.083	.083	.083	.083	.083	.083	·083	.083	—	.083	.083	—
Fore-top-gallant-yard	Main-top-gallant-yard ×	.9	.9	.916	.91	.959	.933	1.	—	—	—	—	1.15	—	—
Fore-top-gallant-yard	Fore-top-sail-yard ×	—	—	—	—	—	—	—	.63	·59	.681	—	—	.72	—
Fore-top-gallant-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	.041	·041	.041	—	.041	.041	—
Fore-royal-yard	Fore-top-gallant-yard ×	.77	.714	.748	.75	.723	.77	.796	—	—	—	—	—	—	—
Fore-royal-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	.041	.041	—	—	—	—	—	—	Length.
Cross-jack-yard	Main-top-sail-yard ×	.9	.9	.936	—	—	—	—	—	—	—	—	—	—	.763
Cross-jack-yard-arm	Length of yard ×	.041	.041	.041	—	—	—	—	—	—	—	—	—	—	—
Mizen-top-sail yard	Main-top-sail-yard ×	.667	.622	.6216	—	—	—	—	—	—	—	—	—	—	—
Mizen-top-sail-yard-arm	Length of yard ×	.083	.083	.083	—	—	—	—	—	—	—	—	—	—	—
Mizen top-gallant-yard	Main-top-gallant-yard ×	.667	.633	.57	—	—	—	—	—	—	—	—	—	—	—
Mizen-top-gallant-yard-arm	Length of yard ×	.041	.041	.041	—	—	—	—	—	—	—	—	—	—	—
Mizen-royal-yard	Mizen-top-gallant-yard ×	.768	.72	.68	—	—	—	—	—	—	—	—	—	—	—
Mizen-royal-yard-arm	Length of yard ×	.041	.041	.041	—	—	—	—	—	—	—	—	—	—	—
Sprit-sail-yard	Fore-top-sail-yard ×	1.00	1.00	1.00	1.00	1.00	—	—	—	—	—	—	—	—	—
Sprit-sail-yard-arm	Length of yard ×	.041	.041	.041	.041	.041	—	—	—	—	—	—	—	—	—
Main or driver-boom	Length ×	.37	.38	.358	.3772	.37	—	—	.272	.36	—	—	.58	.658	.79
Main-gaff	Driver-boom ×	.623	.733	.76	.734	.633	—	—	.765	.61	—	—	.5	.535	.724
Gaff	Length ×	—	—	—	—	—	—	—	—	—	.171	.168	—	—	—
Gaff without the cleats	Gaff ×	—	—	—	—	—	—	—	.063	.07	.095	.069	—	—	—
Main-try-sail-gaff	Gaff ×	.6	.6	.656	.632	.71	—	—	—	—	—	—	—	—	.5
Do., without the cleats	Length of gaff ×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Main-storm-gaff	Gaff ×	—	—	—	—	—	—	—	.678	.756	.725	—	—	—	—
Fore-try-sail	Gaff ×	—	—	—	.66	.778	—	—	1.13	1.	1.	1.24	1.	—	—
Do., without the cleats	Length of gaff ×	—	—	—	—	—	—	—	.665	.08	.095	.08	—	—	—
Fore-storm-gaff	Fore-gaff ×	—	—	—	—	—	—	—	.758	.756	.732	—	—	—	—
Mizen-gaff	Driver-boom ×	—	—	—	—	—	—	—	.66	—	—	—	—	—	—
Mizen-storm-gaff	Mizen-gaff ×	—	—	—	—	—	—	—	.664	—	—	—	—	—	—
Swing-boom	Main-yard ×	.559	.556	.6	.655	.6	—	—	—	—	—	—	—	—	—
Fore-sail-boom	Fore-yard ×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Top-sail-gaff	Mizen-top-mast hounded ×	—	—	—	.596	.55	—	—	—	—	—	—	—	—	—
Spread-yard	Length ×	—	—	—	—	—	—	—	—	—	.318	—	—	—	—
Square-sail-boom and ring-tail	Cross-jack-yard ×	—	—	—	—	—	—	—	—	—	—	—	—	—	.5
Gaff-top-sail & half top-sail-yards	Gaff ×	—	—	—	—	—	—	—	—	—	—	—	—	—	.38

LENGTHS OF MASTS, BOWSPRITS, YARDS, BOOMS, GAFFS, ETC.

SLOOPS WITH ONE MAST.

[Fig. 19, Pl. I

Breadth.	MASTS, TOP-MASTS, AND BOWSPRITS.							Length on Deck.	YARDS, BOOMS, AND GAFFS.						
	Main, whole length.	Headed.	Housed.	Top-mast to Stops.	Pole.	Bowsprit, whole length.	Housed.		Cross-jack.	Boom, whole length.	Gaff.	Try-sail-gaff.	Gaff-top-sail-yard.	Half-top-sail-yard.	Square-sail-boom and Ringtail.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
13.0	44.5	7.9	6.7	25.0	4.3	25.0	7.6	50.	38.2	39.6	28.6	14.3	10.9	10.9	19.1
13.5	46.2	8.2	7.0	25.8	4.5	25.8	7.9	51.	39.0	40.4	29.2	14.6	11.1	11.1	19.5
14.0	48.0	8.5	7.2	26.8	4.6	26.8	8.2	52.	39.7	41.1	29.7	14.9	11.3	11.3	19.9
14.5	49.7	8.8	7.5	27.8	4.8	27.8	8.5	53.	40.5	41.9	30.4	15.1	11.5	11.5	20.2
15.0	51.5	9.1	7.7	28.8	5.0	28.8	8.8	54.	41.2	42.6	30.9	15.4	11.8	11.8	20.6
15.5	53.1	9.4	8.0	29.7	5.1	29.7	9.1	55.	42.0	43.5	31.5	15.7	12.0	12.0	21.0
16.0	54.8	9.7	8.2	30.7	5.3	30.7	9.4	56.	42.8	44.2	32.0	16.0	12.2	12.2	21.4
16.5	56.5	10.0	8.5	31.6	5.5	31.6	9.7	57.	43.6	45.0	32.6	16.2	12.4	12.4	21.7
17.0	58.1	10.3	8.8	32.6	5.6	32.6	10.0	58.	44.2	45.8	33.2	16.5	12.6	12.6	22.1
17.5	59.8	10.6	9.0	33.5	5.8	33.5	10.2	59.	45.0	46.6	33.8	16.8	12.8	12.8	22.5
18.0	61.6	10.9	9.3	34.5	6.0	34.5	10.6	60.	45.8	47.4	34.4	17.1	13.1	13.0	22.9
18.5	63.1	11.3	9.5	35.4	6.1	35.4	10.8	61.	46.5	48.2	34.9	17.4	13.3	13.3	23.3
19.0	65.0	11.5	9.7	36.4	6.3	36.4	11.2	62.	47.3	49.0	35.5	17.7	13.5	13.5	23.7
19.5	66.5	11.8	10.0	37.3	6.5	37.3	11.4	63.	48.1	49.8	36.1	18.0	13.7	13.7	24.0
20.0	68.5	12.1	10.2	38.3	6.6	38.3	11.7	64.	48.8	50.6	36.6	18.2	13.9	13.9	24.4
20.5	70.4	12.4	10.5	39.3	6.8	39.3	12.0	65.	49.6	51.4	37.2	18.5	14.1	14.1	24.8
21.0	72.1	12.8	10.8	40.3	7.0	40.3	12.3	66.	50.3	52.1	37.8	18.8	14.4	14.4	25.2
21.5	73.7	13.0	11.0	41.3	7.1	41.3	12.6	67.	51.1	52.9	38.4	19.1	14.6	14.6	25.6
22.0	75.6	13.4	11.3	42.3	7.3	42.3	12.9	68.	51.8	53.7	38.9	19.4	14.8	14.8	25.9
22.5	77.2	13.7	11.5	43.2	7.5	43.2	13.2	69.	52.6	54.5	39.5	19.7	15.0	15.0	26.3
23.0	79.0	14.0	11.8	44.2	7.6	44.2	13.5	70.	53.4	55.3	40.1	20.0	15.3	15.3	26.7
23.5	80.7	14.2	12.0	45.2	7.8	45.2	13.8	71.	54.1	56.1	40.6	20.2	15.5	15.5	27.1
24.0	82.4	14.6	12.3	46.1	8.0	46.1	14.1	72.	54.9	56.9	41.2	20.5	15.7	15.7	27.5
24.5	84.1	14.8	12.5	47.0	8.1	47.0	14.4	73.	55.7	57.7	41.8	20.8	15.9	15.9	27.9
25.0	86.0	15.2	12.8	48.0	8.3	48.0	14.6	74.	56.5	58.5	42.4	21.1	16.1	16.1	28.3
25.5	87.3	15.5	13.1	49.0	8.5	49.0	14.9	75.	57.2	59.2	42.9	21.4	16.3	16.3	28.6
26.0	89.1	15.8	13.3	49.9	8.6	49.9	15.3	76.	58.0	60.0	43.5	21.7	16.6	16.6	29.0

Length on Deck.	YARDS, BOOMS, AND GAFFS—(*Continued.*)						
	Cross-jack.	Boom, whole length.	Gaff.	Try-sail-gaff.	Gaff-top-sail-yard.	Half-top-sail-yard.	Square-sail boom and Ringtail.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
77.	58.7	60.9	44.0	22.0	16.8	16.8	29.4
78.	59.5	61.6	44.6	22.2	17.0	17.0	29.7
79.	60.4	62.5	45.2	22.5	17.2	17.2	30.1
80.	61.0	63.2	45.8	22.8	17.4	17.4	30.5
81.	61.8	64.0	46.4	23.1	17.6	17.6	30.9
82.	62.5	64.8	47.0	23.4	17.8	17.8	31.3
83.	63.4	65.6	47.6	23.7	18.1	18.1	31.7
84.	64.1	66.4	48.1	24.0	18.3	18.3	32.0
85.	64.8	67.1	48.6	24.2	18.5	18.5	32.4
86.	65.5	67.9	49.2	24.5	18.7	18.7	32.8
87.	66.4	68.7	49.8	24.8	19.0	19.0	33.2
88.	67.1	69.5	50.4	25.1	19.2	19.2	33.6
89.	67.9	70.3	50.9	25.4	19.4	19.4	34.0
90.	68.6	71.1	51.5	25.7	19.6	19.6	34.3
91.	69.3	71.8	52.0	26.0	19.8	19.8	34.7
92.	70.1	72.6	52.6	26.2	20.0	20.0	35.1
93.	70.9	73.4	53.2	26.5	20.3	20.3	35.5
94.	71.8	74.2	53.8	26.8	20.5	20.5	35.9
95.	72.4	75.0	54.3	27.1	20.7	20.7	36.2
96.	73.2	75.8	54.9	27.4	20.9	20.9	36.6
97.	74.0	76.6	55.5	27.7	21.1	21.1	37.0
98.	74.7	77.4	56.0	28.0	21.3	21.3	37.4
99.	75.5	78.2	56.6	28.2	21.6	21.6	37.8
100.	76.3	79.0	57.2	28.5	21.8	21.8	38.1

SCHOONER, TWO MASTS.

Dimensions of Spars, &c. [Fig. 17, Pl. I.

Breadth extreme.	LOWER-MASTS, TOP-MASTS, TOP-GALLANT-MASTS, BOWSPRITS, ETC.													
	MAIN.					FORE.						BOWSPRIT.		Jib-boom whole.
	Lower.			Top-mast.		Lower.			Top-mast.			Whole Length.	Housed.	
	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	To Stops.	Top-gallant-pole.	Sky-sail pole.			
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
10.0	25.7	4.2	5.1	13.1	2.9	24.7	4.2	4.8	9.3	4.8	1.5	15.2	5.7	13.9
10.6	26.9	4.5	5.4	13.8	3.0	25.9	4.5	5.0	9.8	4.9	1.6	15.9	5.9	14.5
11.0	28.1	4.7	5.8	14.4	3.1	27.1	4.7	5.2	10.2	5.1	1.7	16.8	6.1	15.1
11.6	29.2	4.9	5.9	15.0	3.2	28.3	4.9	5.5	10.7	5.4	1.8	17.5	6.5	15.9
12.0	30.8	5.0	6.2	15.8	3.3	29.6	5.0	5.7	11.0	5.7	1.9	18.3	6.8	16.5
12.6	31.9	5.3	6.5	16.4	3.5	30.7	5.3	5.9	11.6	5.9	2.0	18.9	7.0	17.2
13.0	33.2	5.6	6.8	16.9	3.6	31.9	5.6	6.1	12.0	6.0	2.1	19.8	7.3	17.9
13.6	34.5	5.8	7.0	17.7	3.8	33.2	5.8	6.4	12.5	6.3	2.2	20.5	7.6	18.6
14.0	35.8	5.9	7.2	18.3	3.9	34.5	5.9	6.7	12.9	6.6	2.3	21.3	7.9	19.3
14.6	37.0	6.1	7.5	18.9	4.0	35.8	6.1	6.9	13.4	6.9	2.4	22.0	8.1	20.0
15.0	38.4	6.4	7.7	19.7	4.1	36.9	6.4	7.1	13.9	7.0	2.5	22.9	8.4	20.8
15.6	39.5	6.6	8.0	20.2	4.2	38.0	6.6	7.3	14.3	7.2	2.6	23.7	8.7	21.4
16.0	40.9	6.9	8.2	20.8	4.4	39.4	6.9	7.6	14.9	7.5	2.7	24.4	9.0	22.0
16.6	42.1	7.0	8.5	21.6	4.6	40.7	7.0	7.9	15.3	7.8	2.8	25.2	9.2	22.9
17.0	43.5	7.2	8.8	22.2	4.7	41.9	7.2	8.0	15.8	7.9	2.9	25.9	9.5	23.5
17.6	44.9	7.5	9.0	22.8	4.8	43.0	7.5	8.3	16.2	8.1	2.9	26.8	9.9	24.1
18.0	45.8	7.7	9.3	23.6	4.9	44.3	7.7	8.5	16.8	8.3	2.9	27.4	10.0	24.9
18.6	47.3	7.9	9.6	24.2	5.0	45.6	7.9	8.8	17.2	8.6	3.0	28.2	10.3	25.5
19.0	48.6	8.0	9.9	24.9	5.2	46.8	8.0	9.0	17.7	8.9	3.0	28.9	10.7	26.1
19.6	49.8	8.2	10.0	25.5	5.3	47.9	8.2	9.2	18.1	9.0	3.1	29.8	10.9	26.9
20.0	51.1	8.5	10.3	26.1	5.5	49.2	8.5	9.5	18.6	9.3	3.2	30.5	11.1	27.6
20.6	52.5	8.8	10.6	26.9	5.6	50.5	8.8	9.8	19.0	9.6	3.3	31.2	11.5	28.2
21.0	53.7	8.9	10.9	27.5	5.8	51.7	8.9	9.9	19.6	9.8	3.4	31.9	11.8	28.9
21.6	54.9	9.1	11.0	28.1	5.9	52.9	9.1	10.1	20.0	10.0	3.5	32.9	12.0	29.6
22.0	56.3	9.3	11.3	28.9	6.0	54.2	9.3	10.4	20.5	10.2	3.6	33.6	12.3	30.3
22.6	57.6	9.6	11.6	29.5	6.1	55.4	9.6	10.7	20.9	10.5	3.7	34.3	12.6	31.0
23.0	58.8	9.8	11.9	30.0	6.3	56.6	9.8	10.9	21.3	10.7	3.8	34.9	12.9	31.8
23.6	59.9	9.9	12.1	30.8	6.4	57.8	9.9	11.1	21.9	10.9	3.9	35.9	13.9	32.4
24.0	61.5	10.1	12.4	31.4	6.6	58.9	10.1	11.4	22.3	11.1	3.9	36.6	14.5	33.0

Length on Deck.	YARDS, BOOMS, GAFFS, ETC.								
	MAIN.		FORE.						
	Gaff.	Boom.	Lower.	Arm.	Top sail.	Arm.	Top-gallant.	Arm.	Gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
50	17.6	32.9	27.6	1.1	22.6	1.9	16.1	.6	15.9
51	17.9	33.5	28.0	1.1	22.9	1.9	16.5	.6	16.1
52	18.2	34.1	28.7	1.1	23.4	1.9	16.9	.6	16.5
53	18.6	34.9	29.1	1.1	23.9	1.9	17.1	.6	16.9
54	18.9	35.5	29.8	1.2	24.3	2.0	17.5	.6	17.1
55	19.3	36.1	30.3	1.2	24.8	2.0	17.9	.6	17.5
56	19.7	36.8	30.9	1.2	25.1	2.1	18.1	.7	17.9
57	20.0	37.4	31.3	1.2	25.6	2.1	18.5	.7	18.1
58	20.3	38.0	31.9	1.3	26.0	2.1	18.9	.7	18.5
59	20.8	38.8	32.5	1.3	26.6	2.1	19.0	.7	18.8
60	21.0	39.4	32.9	1.3	27.0	2.2	19.4	.7	19.0

SCHOONER, TWO MASTS—(*Continued*).

Dimensions of Spars, &c. [Fig. 17, Pl. I.

Length on Deck.	YARDS, BOOMS, GAFFS, ETC. (*Continued*).								
	MAIN.		FORE.						
	Gaff.	Boom.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
61	21.4	40.0	33.6	1.3	27.5	2.2	19.8	.8	19.4
62	21.8	40.8	34.1	1.4	27.9	2.2	20.0	.8	19.8
63	22.0	41.4	34.8	1.4	28.3	2.3	20.4	.8	20.0
64	22.5	42.0	35.2	1.4	28.8	2.3	20.8	.8	20.3
65	22.9	42.7	35.9	1.4	29.2	2.3	21.0	.8	20.7
66	23.1	43.3	36.4	1.5	29.7	2.4	21.3	.8	20.9
67	23.5	43.9	36.8	1.5	30.1	2.4	21.7	.8	21.3
68	23.9	44.7	37.5	1.5	30.6	2.4	22.0	.9	21.7
69	24.2	45.3	38.0	1.5	31.0	2.5	22.3	.9	22.0
70	24.6	45.9	38.6	1.5	31.5	2.5	22.7	.9	22.3
71	24.9	46.6	39.0	1.5	31.9	2.6	22.9	.9	22.6
72	25.2	47.2	39.7	1.6	32.4	2.6	23.2	.9	22.9
73	25.6	47.9	40.2	1.6	32.9	2.6	23.6	.9	23.2
74	25.9	48.9	40.9	1.6	33.3	2.6	23.9	.9	23.6
75	26.3	49.1	41.3	1.6	33.8	2.7	24.2	1.0	23.9
76	26.7	49.9	41.9	1.6	34.2	2.7	24.5	1.0	24.2
77	27.0	50.5	42.4	1.7	34.7	2.8	24.9	1.0	24.5
78	27.3	51.0	42.9	1.7	35.1	2.8	25.1	1.0	24.8
79	27.7	51.8	43.5	1.7	35.6	2.9	25.5	1.0	25.1
80	28.0	52.4	44.0	1.8	36.0	2.9	25.9	1.0	25.4
81	28.4	53.0	44.7	1.8	36.5	3.0	26.1	1.0	25.7
82	28.8	53.8	45.2	1.8	36.9	3.0	26.5	1.1	26.0
83	29.0	54.4	45.8	1.8	37.4	3.0	26.9	1.1	26.4
84	29.4	55.0	46.3	1.9	37.9	3.0	27.0	1.1	26.8
85	29.8	55.7	46.9	1.9	38.2	3.1	27.4	1.1	27.0
86	30.1	56.3	47.4	1.9	38.8	3.1	27.8	1.1	27.3
87	30.5	56.9	47.9	1.9	39.1	3.1	28.0	1.1	27.7
88	30.9	57.7	48.5	2.0	39.6	3.2	28.4	1.1	27.9
89	31.1	58.3	49.0	2.0	40.0	3.2	28.8	1.1	28.3
90	31.6	58.9	49.6	2.0	40.5	3.2	29.0	1.1	28.6
91	31.9	59.6	50.0	2.0	40.90	2.3	29.4	1.1	28.9
92	32.2	60.2	50.7	2.0	41.4	3.3	29.7	1.2	29.2
93	32.6	60.9	51.2	2.0	41.9	3.3	29.9	1.2	29.5
94	32.9	61.5	51.9	2.1	42.2	3.4	30.2	1.2	29.8
95	33.2	62.1	52.3	2.1	42.8	3.5	30.7	1.2	30.1
96	33.7	62.9	52.9	2.1	43.1	3.5	30.9	1.2	30.5
97	34.0	63.5	53.4	2.1	43.6	3.5	31.3	1.2	30.9
98	34.3	64.1	54.0	2.1	44.0	3.6	31.7	1.2	31.1
99	34.7	64.9	54.6	2.2	44.5	3.6	31.9	1.3	31.5
100	35.0	65.4	55.0	2.2	44.9	3.6	32.2	1.3	31.9
101	35.3	66.0	55.7	2.2	45.4	3.7	32.6	1.3	32.1
102	35.7	66.8	56.2	2.2	45.9	3.7	32.9	1.3	32.5
103	35.9	67.4	56.8	2.2	46.3	3.7	33.1	1.3	32.8
104	36.4	68.0	57.3	2.3	46.8	3.8	33.5	1.3	33.0
105	36.8	68.7	57.9	2.3	47.1	3.8	33.9	1.3	33.4
106	37.0	69.3	58.3	2.3	47.7	3.9	34.1	1.4	33.8
107	37.4	69.9	58.9	2.3	48.0	3.9	34.5	1.4	34.0
108	37.8	70.7	59.4	2.3	48.5	4.0	34.9	1.4	34.4
109	38.1	71.3	60.0	2.4	48.9	4.0	35.1	1.4	34.7
110	38.5	71.8	60.6	2.4	49.4	4.0	35.5	1.4	35.0
111	38.9	72.6	61.0	2.4	49.9	4.1	35.9	1.4	35.3
112	39.1	73.2	61.7	2.4	50.2	4.1	36.0	1.4	35.7
113	39.5	73.9	62.2	2.4	50.8	4.1	36.4	1.4	35.9
114	39.9	74.5	62.8	2.5	51.1	4.2	36.8	1.4	36.2
115	40.2	75.1	63.3	2.5	51.7	4.2	37.0	1.5	36.6
116	40.6	75.9	63.9	2.5	52.0	4.3	37.3	1.5	36.9
117	40.9	76.4	64.4	2.6	52.5	4.3	37.7	1.5	37.2
118	41.2	77.0	64.9	2.6	52.9	4.3	37.9	1.5	37.6
119	41.7	77.8	65.6	2.6	53.4	4.4	38.3	1.5	37.9
120	41.9	78.4	66.0	2.6	53.9	4.4	38.6	1.5	38.1

BRIGANTINE.

[Fig. 18, Pl. I.

Dimensions of Masts, Top-masts, Top-gallant-masts, Bowsprits, Yards, Booms, &c.

	MASTS, TOP-MASTS, ETC.													
	MAIN.					FORE.						BOWSPRIT.		
	Lower.			Top-mast.		Lower.			Top-mast.					
Breadth extreme.	Hounded.	Headed.	Housed.	To Stops.	Pole.	Hounded.	Headed.	Housed.	Whole length Head included.	Top-gallant to Stops.	Royal Pole.	Whole length.	Housed.	Jib-boom whole.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
12.0	33.6	4.2	5.3	9.6	8.5	26.3	3.8	5.3	13.3	6.7	4.6	14.8	5.3	15.2
12.6	34.9	4.4	5.6	9.9	8.9	27.3	3.9	5.6	13.8	6.9	4.8	15.7	5.6	15.9
13.0	36.3	4.6	5.9	10.4	9.0	28.3	4.1	5.9	14.4	7.2	4.9	16.1	5.9	16.5
13.6	37.6	4.8	6.0	10.8	9.4	29.4	4.3	6.0	14.8	7.6	5.1	16.8	6.0	17.1
14.0	39.0	4.9	6.2	11.1	9.8	30.6	4.5	6.2	15.5	7.9	5.4	17.4	6.2	17.9
14.6	40.6	5.0	6.5	11.6	10.1	31.7	4.7	6.5	16.0	8.1	5.6	18.0	6.5	18.4
15.0	41.9	5.2	6.8	11.9	10.5	32.8	4.8	6.8	16.6	8.4	5.8	18.7	6.8	19.0
15.6	43.3	5.5	6.9	12.4	10.9	33.9	4.9	6.9	17.1	8.7	5.9	19.2	6.9	19.7
16.0	44.6	5.7	7.0	12.9	11.1	34.9	5.1	7.0	17.9	8.9	6.1	19.8	7.0	20.3
16.6	45.9	5.9	7.3	13.2	11.5	36.0	5.2	7.3	18.3	9.2	6.3	20.6	7.3	20.9
17.0	47.3	6.0	7.6	13.7	11.9	37.1	5.4	7.6	18.9	9.5	6.5	21.1	7.6	21.6
17.6	48.9	6.2	7.9	14.0	12.2	38.3	5.6	7.9	19.4	9.9	6.8	21.9	7.9	22.2
18.0	50.3	6.4	8.0	14.4	12.6	39.5	5.7	8.0	19.8	10.0	6.9	22.4	8.0	22.9
18.6	51.6	6.6	8.2	14.9	12.9	40.6	5.8	8.2	20.5	10.3	7.0	22.9	8.2	23.5
19.0	53.0	6.8	8.5	15.2	13.2	41.7	5.9	8.5	21.0	10.7	7.2	23.7	8.5	24.1
19.6	54.3	6.9	8.7	15.7	13.6	42.9	6.1	8.7	21.6	10.9	7.4	24.2	8.7	24.8
20.0	55.9	7.0	8.9	16.0	13.9	43.9	6.3	8.9	22.1	11.1	7.6	24.9	8.9	25.4
20.6	57.3	7.2	9.0	16.5	14.3	44.9	6.4	9.0	22.8	11.5	7.8	25.5	9.0	26.0
21.0	58.6	7.4	9.3	16.9	14.8	45.9	6.6	9.3	23.2	11.8	7.9	26.0	9.3	26.7
21.6	60.0	7.6	9.6	17.3	15.0	47.0	6.8	9.6	23.9	12.0	8.1	26.7	9.6	27.3
22.0	61.6	7.8	9.8	17.8	15.4	48.2	6.9	9.8	24.3	12.3	8.3	27.3	9.7	27.8
22.6	62.9	7.9	9.9	18.1	15.8	49.2	7.0	9.9	24.8	12.7	8.6	27.9	9.8	28.6
23.0	64.0	8.1	10.1	18.5	16.0	50.3	7.2	10.1	25.5	12.9	8.8	28.6	10.1	29.1
23.6	65.4	8.3	10.4	18.9	16.4	51.3	7.4	10.4	25.9	13.2	8.9	29.1	10.4	29.9
24.0	66.9	8.5	10.6	19.3	16.8	52.5	7.5	10.6	26.6	13.4	9.1	29.8	10.6	30.4
24.6	68.3	8.7	10.9	19.8	17.0	53.6	7.7	10.8	27.0	13.8	9.3	30.3	10.8	31.0
25.0	69.6	8.9	11.0	20.1	17.4	54.7	7.8	10.9	27.7	14.0	9.5	30.9	11.0	31.8
25.6	71.0	9.0	11.2	20.6	17.9	55.8	7.9	11.2	28.1	14.2	9.7	31.7	11.2	32.3
26.0	72.6	9.1	11.4	20.9	18.1	56.9	8.1	11.4	28.8	14.6	9.8	32.3	11.4	32.9
26.6	74.0	9.3	11.7	21.3	18.5	57.9	8.3	11.7	29.2	14.9	9.9	32.9	11.7	33.6
27.0	75.3	9.5	11.9	21.8	18.9	58.9	8.5	11.9	29.9	15.0	10.2	33.6	11.9	34.1
27.6	76.9	9.7	12.0	22.0	19.2	60.0	8.6	12.0	30.4	15.3	10.4	34.1	12.0	34.9
28.0	78.0	9.9	12.3	22.4	19.6	61.2	8.8	12.3	30.8	15.7	10.7	34.8	12.3	35.4
28.6	79.4	10.0	12.6	22.9	19.9	62.4	8.9	12.6	31.5	15.9	10.8	35.4	12.6	36.0
29.0	81.0	10.2	12.9	23.2	20.2	63.6	9.0	12.9	32.0	16.1	10.9	35.9	12.9	36.7

	YARDS, GAFFS, BOOMS.												
	MAIN.			FORE.									
	Set Flying.												
Length on Deck.	Lower.	Top-sail.	Top-gallant.	Gaff.	Boom.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
55	29.0	19.0	13.3	15.9	31.8	29.0	1.3	24.3	2.1	15.5	0.7	15.9
56	29.6	19.4	13.7	16.0	32.4	29.6	1.3	24.8	2.1	15.7	0.7	16.0
57	30.1	19.8	13.9	16.3	32.9	30.1	1.3	25.1	2.1	15.9	0.7	16.3
58	30.7	20.0	14.1	16.7	33.6	30.7	1.3	25.7	2.2	16.1	0.7	16.6
59	31.2	20.4	14.4	16.9	34.1	31.2	1.3	26.0	2.2	16.4	0.7	16.9
60	31.8	20.8	14.7	17.2	34.8	31.8	1.3	26.5	2.2	16.7	0.7	17.2
61	32.2	21.1	14.9	17.6	35.3	32.2	1.3	26.9	2.3	17.0	0.7	17.6
62	32.8	21.5	15.0	17.9	35.8	32.8	1.4	27.4	2.3	17.4	0.7	17.9
63	33.3	21.9	15.3	18.1	36.5	33.3	1.4	27.8	2.3	17.6	0.7	18.1
64	33.9	22.1	15.6	18.4	37.0	33.9	1.4	28.3	2.4	17.9	0.8	18.4
65	34.3	22.5	15.9	18.7	37.7	34.3	1.4	28.8	2.4	18.3	0.8	18.7

BRIGANTINE—(*Continued*).

[Fig. 18, Il. I.

Dimensions of Masts, Top-masts, Top-gallant-masts, Bowsprits, Yards, Booms, &c.

Length on Deck.	YARDS, GAFFS, BOOMS.—(*Continued.*)											
	MAIN.			FORE.								
	Set Flying.											
	Lower.	Top-sail.	Top-gallant.	Gaff.	Boom.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Gaff.
ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
66	34.9	22.9	16.0	18.9	38.2	34.9	1.4	29.1	2.5	18.6	0.8	18.9
67	35.4	23.1	16.3	19.2	38.9	35.4	1.5	29.6	2.5	18.8	0.8	19.2
68	35.8	23.5	16.6	19.6	39.4	35.9	1.5	30.0	2.6	19.0	0.8	19.6
69	36.5	23.9	16.9	19.9	39.9	36.5	1.5	30.6	2.6	19.3	0.8	19.9
70	36.9	24.1	17.0	20.0	40.6	36.9	1.5	30.9	2.7	19.6	0.8	20.0
71	37.5	24.6	17.3	20.3	41.1	37.5	1.6	31.3	2.7	19.9	0.8	20.3
72	38.0	24.8	17.6	20.7	41.8	38.0	1.6	31.9	2.7	20.1	0.9	20.7
73	38.6	25.2	17.9	20.9	42.3	38.6	1.6	32.2	2.7	20.5	0.9	20.9
74	39.0	25.6	18.0	21.2	42.9	39.0	1.6	32.8	2.8	20.7	0.9	21.2
75	39.6	25.9	18.3	21.5	43.4	39.6	1.7	33.1	2.8	20.9	0.9	21.5
76	40.0	26.2	18.6	21.9	43.9	40.0	1.7	33.6	2.8	21.3	0.9	21.9
77	40.6	26.6	18.8	22.0	44.6	40.6	1.7	33.9	2.8	21.6	0.9	22.0
78	41.1	26.9	18.9	22.4	45.1	41.1	1.7	34.4	2.9	21.9	0.9	22.4
79	41.7	27.2	19.2	22.7	45.8	41.7	1.8	34.8	2.9	22.0	0.9	22.7
80	42.2	27.6	19.5	22.9	46.3	42.2	1.8	35.4	3.0	22.4	0.9	22.9
81	42.8	27.9	19.7	23.2	46.9	42.8	1.8	35.9	3.0	22.7	1.0	23.2
82	43.2	28.3	19.9	23.6	47.5	43.2	1.8	36.2	3.0	22.9	1.0	23.6
83	43.9	28.7	20.2	23.9	48.0	43.9	1.8	36.8	3.1	23.2	1.0	23.9
84	44.3	28.9	20.5	24.1	48.7	44.3	1.8	37.1	3.1	23.5	1.0	24.1
85	44.9	29.3	20.7	24.4	49.1	44.9	1.8	37.6	3.2	23.8	1.0	24.4
86	45.3	29.7	20.9	24.7	49.8	45.3	1.8	37.9	3.2	24.0	1.0	24.7
87	45.8	29.9	21.2	24.9	50.3	45.8	1.9	38.4	3.3	24.4	1.0	24.9
88	46.4	30.4	21.4	25.2	50.9	46.4	1.9	38.8	3.3	24.7	1.1	25.2
89	46.8	30.8	21.7	25.6	51.5	46.8	1.9	39.3	3.3	24.9	1.1	25.6
90	47.5	31.0	21.9	25.9	52.0	47.5	1.9	39.9	3.4	25.1	1.1	25.9
91	48.0	31.4	22.1	26.0	52.7	48.0	2.0	40.2	3.4	25.5	1.1	26.0
92	48.6	31.8	22.4	26.4	53.2	48.6	2.0	40.7	3.5	25.7	1.1	26.4
93	49.0	32.0	22.7	26.7	53.9	49.0	2.0	41.0	3.5	25.9	1.1	26.7
94	49.6	32.5	22.9	26.9	54.4	49.6	2.0	41.5	3.6	26.2	1.1	26.9
95	50.0	32.9	23.1	27.2	54.9	50.0	2.1	41.9	3.6	26.5	1.1	27.2
96	50.7	33.1	23.3	27.6	55.6	50.7	2.1	42.4	3.6	26.9	1.2	27.6
97	51.1	33.5	23.6	27.9	56.1	51.1	2.1	42.9	3.7	27.0	1.2	27.9
98	51.7	33.9	23.9	28.1	56.8	51.7	2.1	43.3	3.7	27.3	1.2	28.1
99	52.1	34.1	24.0	28.4	57.3	52.1	2.2	43.8	3.7	27.6	1.2	28.4
100	52.7	34.5	24.3	28.7	57.8	52.7	2.2	44.1	3.7	27.9	1.2	28.7
101	53.2	34.9	24.6	28.9	58.5	53.2	2.2	44.6	3.7	28.1	1.2	28.9
102	53.9	35.1	24.9	29.3	59.0	53.9	2.2	44.9	3.7	28.5	1.2	29.3
103	54.3	35.5	25.0	29.6	59.6	54.3	2.3	45.5	3.7	28.8	1.2	29.6
104	54.9	35.9	25.3	29.9	60.3	54.9	2.3	45.8	3.8	29.0	1.2	29.9
105	55.3	36.1	25.6	30.1	60.9	55.3	2.3	46.3	3.8	29.3	1.2	30.1
106	55.8	36.5	25.9	30.5	61.5	55.9	2.3	46.9	3.8	29.6	1.2	30.5
107	56.4	36.9	26.0	30.8	62.0	56.4	2.4	47.2	3.9	29.9	1.3	30.8
108	56.8	37.2	26.3	31.0	62.7	56.9	2.4	47.7	3.9	30.0	1.3	31.0
109	57.4	37.6	26.6	31.3	63.2	57.4	2.4	48.1	4.0	30.3	1.3	31.3
110	57.9	37.9	26.9	31.6	63.9	57.9	2.4	48.6	4.0	30.7	1.3	31.6
111	58.5	38.2	27.0	31.9	64.4	58.5	2.4	48.9	4.0	30.9	1.3	31.9
112	58.9	38.6	27.2	32.1	64.9	58.9	2.5	49.4	4.1	31.2	1.3	32.1
113	59.6	38.9	27.5	32.4	65.6	59.6	2.5	49.9	4.1	31.5	1.3	32.4
114	60.0	39.3	27.7	32.8	66.1	60.0	2.5	50.3	4.1	31.8	1.3	32.8
115	60.7	39.7	27.9	33.0	66.8	60.7	2.5	50.8	4.2	32.0	1.3	33.0
116	61.1	39.9	28.1	33.3	67.3	61.1	2.6	51.2	4.2	32.3	1.3	33.3
117	61.7	40.3	28.5	33.6	67.9	61.7	2.6	51.7	4.2	32.6	1.4	33.6
118	62.1	40.7	28.7	33.9	68.5	62.1	2.6	52.0	4.3	32.9	1.4	33.8
119	62.8	40.9	28.9	34.1	69.0	62.8	2.6	52.6	4.3	33.2	1.4	34.1
120	63.2	41.3	29.2	34.4	69.7	63.2	2.6	52.9	4.3	33.5	1.4	34.4
121	63.8	41.7	29.5	34.8	70.2	63.8	2.7	53.4	4.3	33.7	1.4	34.8
122	64.2	42.0	29.7	35.0	70.9	64.2	2.7	53.9	4.4	33.9	1.4	35.0
123	64.9	42.4	29.9	35.3	71.4	64.9	2.7	54.3	4.4	34.2	1.4	35.5
124	65.3	42.8	30.2	35.7	71.9	65.3	2.7	54.8	4.5	34.6	1.4	35.7
125	65.9	43.0	30.4	35.9	72.6	65.9	2.7	55.1	4.5	34.8	1.4	35.9

MERCHANT BRIGS AS COLLIERS

[Fig. 30, Pl. I.

Dimensions of Ship.	MAIN AND FORE YARDS.				Fore-sail Boom.	Main Room.	Main Gaff.	Fore-try-sail Gaff.	YARD-ARMS.			
Length.	Lower.	Top-sail.	Top-gallant.	Royal.					Lower.	Top-sail.	Top-gallant.	Royal.
50	24.95	20.35	14.28	11.35	22.2	21.85	18.5	9.95	1.0	1.65	.6	.45
51	25.45	20.75	14.54	11.55	22.6	22.3	18.9	10.1	1.02	1.68	.61	.455
52	25.95	21.15	14.8	11.78	23.04	22.75	19.28	10.3	1.04	1.71	.62	.46
53	26.45	21.56	15.1	12.0	23.5	23.15	19.65	10.5	1.06	1.74	.63	.465
54	26.95	21.95	15.4	12.2	23.9	23.6	20.0	10.7	1.08	1.77	.64	.47
55	27.45	22.38	15.72	12.41	24.4	24.0	20.4	10.9	1.1	1.8	.65	.475
56	27.98	22.8	16.0	12.68	24.82	24.5	20.8	11.1	1.13	1.83	.66	.48
57	28.42	23.2	16.24	12.9	25.25	24.9	21.1	11.3	1.16	1.86	.67	.49
58	28.95	23.6	16.52	13.12	25.7	25.35	21.5	11.5	1.19	1.89	.68	.50
59	29.46	24.0	16.8	13.35	26.15	25.8	21.9	11.7	1.21	1.92	.69	.51
60	29.98	24.4	17.08	13.6	26.6	26.2	22.25	11.9	1.24	1.95	.7	.52
61	30.5	24.8	17.4	13.8	27.0	26.65	22.65	12.1	1.26	1.98	.71	.525
62	31.0	25.2	17.63	14.05	27.45	27.1	23.0	12.3	1.28	2.01	.72	.53
63	31.48	25.6	17.95	14.25	27.9	27.55	23.35	12.5	1.3	2.04	.73	.535
64	31.98	26.0	18.23	14.5	28.35	27.95	23.7	12.7	1.32	2.07	.74	.54
65	32.5	26.4	18.5	14.7	28.8	28.4	24.1	12.9	1.34	2.1	.75	.55
66	33.0	26.82	18.8	14.92	29.25	28.83	24.48	13.1	1.36	2.13	.76	.56
67	33.5	27·25	19.1	15.16	29.7	29.38	24.85	13.3	1.38	2.16	·77	.57
68	34.0	27·67	19.4	15.4	30.15	29.75	25.2	13.5	1.4	2.20	.79	.58
69	34.5	28.0	19.65	15.6	30.55	30.15	25.5	13.7	1.42	2.24	.81	.59
70	35.0	28.45	19.95	15.84	31.05	30.6	25.95	13.9	1.45	2.28	.82	.6
71	35.5	28.90	20.24	16.05	31.5	31.0	26.35	14.1	1.47	2.31	.83	.61
72	36 0	29.29	20.5	16.26	31.9	31.45	26.7	14.3	1.49	2.34	.85	.63
73	36.5	29.68	20.8	16.5	32.4	31.85	27.05	14.5	1.51	2.37	.86	.64
74	37.0	30.1	21.08	16.72	32.8	32.3	27.4	14.7	1.53	2.40	.87	.66
75	37.5	30.5	21.35	16.95	33.25	32.8	27.8	14.9	1.55	2.45	.88	.67
76	38.0	30.9	21.65	17.18	33.7	33.2	28.18	15.1	1.58	2.46	.9	.69
77	38.5	31.3	21.94	17.4	34.14	33.65	28.5	15.3	1.6	2.5	.91	.7
78	39.0	31.72	22.2	17.62	34.6	34.1	28.9	15.5	1.63	2.53	.93	.72
79	39.5	32.15	22.5	17.85	35.04	34.55	29.25	15.7	1.66	2.56	.94	.73
80	40.0	32.6	22.8	18.1	35.5	35.0	29.75	15.9	1.68	2.6	.95	.75
81	40.5	33.0	23.08	18.3	35.94	35.45	30.05	16.05	1.7	2.64	.96	.76
82	41.0	33.4	23.4	18.52	36.4	35.85	30.4	16.25	1.72	2.68	.97	.77
83	41.5	33.8	23.65	18.78	36.85	36.3	30.8	16.45	1.75	2.72	.98	.78
84	42.0	34.2	23.92	19.0	37.3	36.7	31.15	16.65	1.77	2.76	.99	.79
85	42.5	34.6	24.2	19.2	37.7	37.15	31.5	16.85	1.79	2.8	1.0	.8
86	43.0	35.0	24.5	19.5	38.1	37.55	31.9	17.04	1.82	2.84	1.01	.81
87	43.5	35.4	24.8	19.7	38.6	38.0	32.25	17.24	1.84	2.88	1.02	.82
88	44.0	35.8	25.08	19.9	39.0	38.45	32.6	17.43	1.86	2.92	1.03	.83
89	44.5	36.2	25.35	20.15	39.5	38.9	33.0	17.62	1.88	2.96	1.04	.84
90	45.0	36.6	25.65	20.4	39.95	39.35	33.38	17.84	1.9	3.0	1.05	.85
91	45.5	37.02	25.94	20.6	40.35	39.75	33.75	18.04	1.92	3.04	1.07	.86
92	46.0	37.42	26.2	20.83	40.8	40.2	34.1	18.23	1.95	3.07	1.08	.865
93	46.5	37.83	26.5	21.06	41.3	40.6	34.5	18.44	1.97	3.1	1.1	.87
94	47.0	38.24	26.8	21.3	41.74	41.11	34.88	18.64	2.0	3.14	1.11	.88
95	47.5	38.66	27.1	21.5	42.15	41.55	35.25	18.84	2.02	3.17	1.13	.885
96	48.0	39.06	27.38	21.75	42.6	42.0	35.6	19.0	2.05	3.2	1.15	.89
97	48.5	39.48	27.64	21.95	43.05	42.45	36.0	19.22	2.07	3.24	1.16	.9
98	49.0	39.88	27.88	22.2	43.5	42.85	36.35	19.4	2.09	3.27	1.18	.91
99	49.52	40.3	28.2	22.45	43.95	43.35	36.7	19.62	2.11	3.3	1.19	.92
100	50.1	40.7	28.5	22.68	44.4	43.8	37.1	19.84	2.13	3.33	1.2	.93
101	50.52	51.1	28.8	22.9	44.8	44.2	37.5	20.0	2.15	3.36	1.21	.94
102	51.0	51.5	29.1	23.14	45.28	44.6	37.85	20.2	2.18	3.4	1.23	.95

MERCHANT BRIGS AS COLLIERS.

[Fig. 30, Pl. I.

Dimensions of Ship.	LOWER-MASTS.						Main and Fore Top-masts.		Top-gallant.	Royal.	Pole.	Bowsprit.	Jib-boom.	Pole.	Bowsprit Housed.
	Main.			Fore.											
Breadth.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	Hounded.	Headed.	To Stops or Hounded.	To Stops or Hounded.	Pole.				
18.	32.55	6.43	9.35	30.4	5.4	9.5	17.5	3.35	10.2	6.75	1.7	22.4	20.3	1.7	6.45
18.5	33.45	6.6	9.6	31.25	5.55	9.8	17.95	3.44	10.5	7.0	1.72	23.0	20.9	1.72	6.6
19.	34.35	6.8	9.9	32.1	5.7	10.0	18.48	3.52	10.74	7.15	1.78	23.6	21.48	1.78	6.8
19.5	35.28	6.98	10.15	32.95	5.9	10.3	18.95	3.61	11.0	7.35	1.8	24.2	22.0	1.8	6.98
20.	36.2	7.16	10.4	33.4	6.0	10.6	19.45	3.71	11.3	7.54	1.85	24.9	22.53	1.85	7.16
20.5	37.05	7.34	10.65	34.6	6.15	10.85	19.9	3.8	11.58	7.7	1.9	25.45	23.1	1.9	7.34
21.	38.0	7.52	10.92	35.5	6.36	11.1	20.45	3.9	11.88	7.9	1.95	26.15	23.7	1.95	7.54
21.5	38.85	7.7	11.18	36.3	6.46	11.35	20.9	3.99	12.1	8.08	2.0	26.7	24.2	2.0	7.7
22.	39.72	7.88	11.42	37.2	6.75	11.62	21.4	4.09	12.4	8.25	2.05	27.3	24.8	2.05	7.88
22.5	40.6	8.06	11.7	38.0	6.75	11.9	21.85	4.18	12.7	8.44	2.1	27.95	25.4	2.1	8.06
23.	41.55	8.2	12.0	38.9	6.95	12.15	22.4	4.27	13.0	8.65	2.15	28.6	25.92	2.15	8.2
23.5	42.4	8.36	12.2	39.7	7.05	12.4	22.8	4.37	13.28	8.82	2.2	29.2	26.48	2.2	8.36
24.	43.35	8.58	12.45	40.55	7.25	12.7	23.35	4.46	13.56	9.0	2.25	29.8	27.05	2.25	8.58
24.5	44.25	8.75	12.7	41.38	7.35	12.95	23.78	4.55	13.8	9.2	2.3	30.4	27.6	2.3	8.75
25.	45.2	8.9	13.0	42.25	7.5	13.2	24.32	4.65	14.1	9.4	2.35	31.0	28.2	2.35	8.9
25.5	46.1	9.1	13.28	43.1	7.65	13.5	24.72	4.74	14.4	9.6	2.4	31.6	28.8	2.4	9.1
26.	47.05	9.3	13.55	44.05	7.8	13.78	25.3	4.84	14.7	9.8	2.45	32.3	29.4	2.45	9.3
26.5	48.0	9.5	13.8	44.8	8.0	14.0	25.8	4.94	15.0	10.0	2.5	32.95	30.0	2.5	9.5
27.	48.95	9.68	14.1	45.8	8.15	14.3	26.3	5.03	15.3	10.2	2.54	33.6	30.5	2.54	9.68
27.5	49.83	9.8	14.3	46.6	8.3	14.55	26.78	5.12	15.56	10.4	2.58	34.2	31.0	2.58	9.8
28.	50.73	10.0	14.6	47.4	8.45	14.85	27.3	5.22	15.86	10.56	2.63	34.85	31.64	2.63	10.0
28.5	51.62	10.2	14.85	48.2	8.55	15.05	27.75	5.3	16.1	10.72	2.66	35.45	32.18	2.66	10.2
29.	52.6	10.38	15.1	49.13	8.76	15.35	28.25	5.4	16.4	10.9	2.72	36.1	32.75	2.72	10.38
29.5	53.45	10.5	15.33	49.9	8.85	15.6	28.72	5.5	16.7	11.1	2.75	36.7	33.3	2.75	10.5
30.	54.3	10.7	15.6	50.8	9.0	15.9	29.2	5.6	17.0	11.3	2.80	37.35	33.9	2.8	10.7

MERCHANT BRIGS.

[Fig. 29, Pl. I.

Dimensions of Ship.	MAIN-YARDS.								FORE-YARDS.												
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Sprit-sail-yard.	Arm.	Main-boom.	Main-gaff.	Fore-try-sail-gaff.
50	25.05	1.0	19.24	1.54	13.15	.50	10.2	.37	23.3	.91	17.91	1.43	12.3	.44	9.5	.32	17.91	.75	26.0	15.52	11.43
51	25.52	1.02	19.6	1.57	13.4	.51	10.4	.38	23.76	.94	18.3	1.46	12.5	.44	9.7	.33	18.3	.76	26.5	15.85	11.63
52	26.0	1.04	20.0	1.6	13.63	.52	10.6	.39	24.22	.96	18.65	1.49	12.75	.45	9.9	.34	18.65	.78	27.02	16.14	11.85
53	26.52	1.07	20.4	1.63	13.95	.53	10.8	.40	24.7	.98	19.0	1.52	13.0	.46	10.1	.35	19.0	.79	27.55	16.46	12.1
54	27.02	1.1	20.8	1.66	14.2	.54	11.0	.41	25.16	1.00	19.38	1.55	13.25	.47	10.26	.36	19.38	.80	28.06	16.8	12.32
55	27.53	1.13	21.18	1.69	14.45	.55	11.2	.42	25.62	1.02	19.78	1.58	13.5	.48	10.45	.37	19.78	.82	28.58	17.1	12.55
56	28.08	1.16	21.57	1.72	14.7	.56	11.4	.43	26.1	1.04	20.13	1.61	13.75	.49	10.64	.38	20.13	.84	29.12	17.4	12.8
57	28.53	1.19	21.93	1.76	14.98	.57	11.6	.44	26.55	1.06	20.5	1.63	14.0	.50	10.83	.39	20.5	.85	29.62	17.7	13.02
58	29.06	1.22	22.3	1.80	15.25	.58	11.82	.45	27.02	1.07	20.83	1.67	14.25	.51	11.0	.40	20.83	.86	30.15	18.0	13.25
59	29.54	1.25	22.7	1.84	15.5	.59	12.02	.46	27.5	1.09	21.2	1.71	14.5	.52	11.2	.41	21.2	.88	30.65	18.32	13.5
60	30.05	1.28	23.1	1.87	15.78	.60	12.22	.47	27.95	1.11	21.54	1.75	14.75	.53	11.4	.42	21.55	.90	31.2	18.66	13.72
61	30.55	1.30	23.5	1.9	16.05	.61	12.43	.48	28.46	1.13	21.9	1.78	15.0	.54	11.6	.43	21.9	.91	31.82	18.96	13.94
62	31.05	1.32	23.9	1.93	16.28	.62	12.64	.49	28.9	1.15	22.25	1.81	15.25	.55	11.78	.44	22.25	.92	32.23	19.28	14.16
63	31.55	1.34	24.25	1.96	16.55	.63	12.85	.50	29.4	1.17	22.62	1.84	15.5	.56	11.98	.45	22.62	.93	32.73	19.6	14.38
64	32.05	1.35	24.65	1.99	16.83	.64	13.06	.51	29.85	1.19	23.0	1.87	15.75	.57	12.17	.46	23.0	.94	33.3	19.92	14.62
65	32.56	1.36	25.05	2.02	17.1	.64	13.27	.52	30.33	1.21	23.38	1.9	16.0	.58	12.36	.47	23.38	.95	33.8	20.22	14.88
66	33.06	1.37	25.43	2.05	17.38	.65	13.48	.53	30.8	1.23	23.7	1.93	16.23	.59	12.55	.48	23.7	.96	34.35	20.54	15.1
67	33.58	1.38	25.82	2.09	17.65	.66	13.69	.54	31.3	1.25	24.1	1.96	16.46	.60	12.74	.49	24.1	.97	34.86	20.86	15.33
68	34.08	1.39	26.2	2.13	17.9	.67	13.9	.55	31.76	1.27	24.45	1.99	16.71	.61	12.93	.50	24.45	.98	35.42	21.2	15.54
69	34.58	1.40	26.55	2.17	18.14	.69	14.1	.56	32.19	1.29	24.8	2.02	16.95	.62	13.12	.51	24.8	.99	35.88	21.43	15.78
70	35.1	1.41	27.0	2.2	18.4	.72	14.3	.57	32.7	1.30	25.18	2.05	17.2	.63	13.31	.52	25.18	1.0	36.45	21.81	16.0
71	35.6	1.43	27.35	2.23	18.65	.73	14.5	.58	33.2	1.32	25.52	2.08	17.45	.65	13.5	.53	25.52	1.02	37.0	22.15	16.22
72	36.1	1.45	27.74	2.26	18.96	.74	14.7	.59	33.6	1.34	25.19	2.11	17.7	.66	13.69	.54	25.89	1.04	37.5	22.45	16.45
73	36.6	1.47	28.1	2.29	19.22	.75	14.9	.60	34.1	1.36	26.21	2.14	17.92	.67	13.89	.54	26.21	1.06	38.0	22.75	16.68
74	37.1	1.5	28.48	2.32	19.5	.76	15.1	.61	34.58	1.38	26.6	2.17	18.17	.68	14.08	.55	26.6	1.08	38.6	23.05	16.9
75	37.6	1.53	28.98	2.35	19.75	.77	15.3	.62	35.0	1.40	26.95	2.2	18.43	.69	14.29	.56	26.99	1.10	39.1	23.4	17.15
76	38.1	1.56	29.25	2.38	20.0	.78	15.5	.63	35.55	1.42	27.33	2.23	18.67	.70	14.46	.57	27.33	1.12	39.6	23.67	17.38

MERCHANT BRIGS—(*Continued*).

[Fig. 29, Pl. I.

Dimensions of Ship.	MAIN-YARDS—(*Continued*).								FORE-YARDS—(*Continued*).												
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Sprit-sail-yard.	Arm.	Main-boom.	Main-gaff.	Fore-try-sail-gaff.
77	38.6	1.59	29.6	2.41	20.25	.79	15.7	.64	35.96	1.44	27.63	2.26	18.9	.71	14.65	.58	27.63	1.14	40.1	24.0	17.6
78	39.1	1.61	30.08	2.44	20.51	.81	15.9	.65	36.42	1.46	28.0	2.29	19.13	.72	14.84	.58	28.0	1.16	40.65	24.3	17.85
79	39.6	1.63	30.48	2.47	20.8	.82	16.1	.66	36.90	1.48	28.4	2.32	19.4	.73	15.02	.59	28.4	1.18	41.18	24.6	18.1
80	40.1	1.65	30.82	2.5	21.08	.84	16.3	.67	37.48	1.50	28.8	2.35	19.65	.75	15.23	.60	28.8	1.2	41.7	24.92	18.32
81	40.6	1.67	31.2	2.53	21.33	.85	16.5	.68	37.82	1.52	29.17	2.38	19.91	.77	15.4	.61	29.17	1.21	42.22	25.25	18.5
82	41.1	1.69	31.51	2.56	21.6	.86	16.7	.69	38.3	1.54	29.5	2.41	20.16	.78	15.6	.62	29.5	1.23	42.72	25.54	18.72
83	41.6	1.71	32.0	2.59	21.9	.87	16.92	.70	38.8	1.56	29.88	2.44	20.4	.79	15.8	.63	29.88	1.25	43.3	25.88	19.0
84	42.1	1.73	32.4	2.61	22.18	.88	17.13	.71	39.22	1.58	30.24	2.47	20.67	.8	16.0	.64	30.24	1.26	43.8	26.2	19.2
85	42.62	1.75	32.78	2.64	22.4	.89	17.34	.72	39.7	1.60	30.6	2.5	20.9	.81	16.16	.65	30.6	1.28	44.3	26.5	19.45
86	43.2	1.79	33.12	2.68	22.68	.91	17.55	.73	40.14	1.62	30.92	2.54	21.13	.82	16.35	.66	30.92	1.29	44.8	26.8	19.7
87	43.62	1.79	33.55	2.72	22.95	.93	17.76	.74	40.63	1.64	31.3	2.57	21.4	.84	16.55	.67	31.3	1.30	45.32	27.15	19.93
88	44.12	1.81	33.95	2.76	23.2	.95	17.96	.75	41.1	1.66	31.7	2.61	21.65	.85	16.75	.68	31.7	1.32	45.84	27.45	20.2
89	44.63	1.83	34.33	2.81	23.5	.96	18.17	.76	41.57	1.69	32.05	2.65	21.9	.87	16.94	.69	32.05	1.33	46.36	27.75	20.4
90	45.13	1.86	34.7	2.85	23.8	.98	18.38	.77	42.02	1.73	32.4	2.68	22.15	.88	17.13	.70	32.4	1.35	46.9	28.08	20.65
91	45.66	1.88	35.1	2.88	24.02	.99	18.59	.78	42.5	1.76	32.76	2.71	22.41	.89	17.32	.71	32.76	1.36	47.42	28.38	20.85
92	46.16	1.9	35.5	2.91	24.25	1.0	18.8	.79	42.90	1.78	33.1	2.74	22.65	.9	17.51	.72	33.1	1.37	47.95	28.7	21.08
93	46.67	1.92	35.9	2.94	24.51	1.01	19.0	.80	43.45	1.80	33.48	2.74	22.9	.91	17.7	.73	33.48	1.39	48.5	29.0	21.3
94	47.18	1.94	36.28	2.97	24.8	1.02	19.2	.81	43.92	1.82	33.82	2.77	23.15	.92	17.9	.74	33.82	1.40	49.0	29.32	21.52
95	47.68	1.96	36.62	3.0	25.05	1.03	19.4	.82	44.36	1.84	34.2	2.80	23.4	.93	18.09	.75	34.2	1.42	49.52	29.64	21.75
96	48.19	1.98	37.0	3.04	25.3	1.05	19.6	.83	44.82	1.86	34.57	2.83	23.6	.94	18.3	.76	34.57	1.43	50.0	29.96	22.0
97	48.69	2.0	37.4	3.08	25.58	1.06	19.81	.84	45.3	1.88	34.9	2.86	23.87	.96	18.48	.77	34.9	1.45	50.54	30.26	22.22
98	49.19	2.03	37.8	3.12	25.82	1.08	20.0	.85	45.75	1.90	35.25	2.89	24.15	.98	18.67	.78	36.25	1.47	51.05	30.55	22.45
99	49.7	2.06	38.2	3.16	26.1	1.09	20.21	.86	46.22	1.92	35.64	2.95	24.4	.99	18.86	.79	35.64	1.49	51.6	30.8	22.7
100	50.2	2.08	38.6	3.19	26.38	1.1	20.42	.87	46.7	1.95	36.0	3.0	24.6	1.0	19.05	.80	36.0	1.50	52.1	31.2	22.92
101	50.7	2.1	39.0	3.22	26.61	1.12	20.64	.88	47.2	1.97	36.38	3.04	24.9	1.01	19.24	.81	36.38	1.51	52.62	31.5	23.14
102	51.2	2.12	39.4	3.26	26.85	1.14	20.85	.89	47.6	2.0	36.74	3.08	25.1	1.02	19.43	.82	36.74	1.53	53.2	31.8	23.38

MERCHANT BRIGS.

[Fig 29, Pl. I.

Dimensions of Ship.	LOWER-MASTS.						TOP-MASTS.				TOP-GALLANT-MASTS.				GUNTER-MASTS.				Bowsprit.	Jib-boom.	Flying-jib-boom.	Pole.
	Main.			Fore.			Main.		Fore.		Main.		Fore.		Main.		Fore.					
Breadth.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.				
18.	37.6	7.3	11.25	35.08	7.5	11.68	21.38	3.48	19.96	3.22	13.04	1.84	12.1	1.7	16.9	2.42	15.8	2.25	24.75	24.75	27.75	2.65
18.5	38.6	7.72	11.55	36.0	7.25	12.0	21.83	3.58	20.5	3.32	13.4	1.9	12.5	1.75	17.4	2.5	16.2	2.3	25.44	25.44	28.5	2.7
19.	39.65	7.95	11.88	36.95	7.45	12.3	22.52	3.68	21.05	3.42	13.72	1.95	12.85	1.8	17.8	2.58	16.6	2.37	26.15	26.15	29.3	2.76
19.5	40.7	8.15	12.19	47.98	7.65	12.61	23.1	3.78	21.55	3.52	14.1	2.0	13.18	1.85	18.3	2.65	17.05	2.41	26.8	26.8	30.0	2.83
20.	41.85	8.37	12.52	39.0	7.85	12.96	23.7	3.88	22.15	3.58	14.5	2.05	13.52	1.9	18.8	2.7	17.54	2.49	27.5	27.5	30.8	2.95
20.5	42.85	8.57	12.94	40.0	8.0	13.3	24.25	3.96	22.65	3.67	14.82	2.1	13.86	1.95	19.2	2.75	17.95	2.55	28.18	28.18	31.5	3.0
21.	43.90	8.78	13.16	40.9	8.2	13.62	24.9	4.05	23.38	3.77	15.2	2.15	14.2	2.0	19.7	2.8	18.43	2.63	28.92	28.92	32.35	3.1
21.5	44.92	8.98	13.48	41.85	8.4	13.95	25.42	4.13	23.8	3.86	15.52	2.2	14.5	2.05	20.2	2.85	18.84	2.7	29.54	29.54	33.1	3.17
22.	45.95	9.19	13.8	42.8	8.6	14.25	26.03	4.21	24.34	3.95	15.9	2.25	14.85	2.1	20.65	2.94	19.26	2.75	30.3	30.3	33.9	3.22
22.5	46.98	9.39	14.12	43.75	8.8	14.57	26.6	4.31	24.85	4.03	16.22	2.3	15.2	2.15	21.1	3.0	19.7	2.81	30.9	30.9	34.6	3.3
23.	48.0	9.6	14.44	44.7	9.0	14.93	27.28	4.4	25.46	4.12	16.65	2.35	15.52	2.2	21.6	3.1	20.18	2.89	31.6	31.6	35.45	3.38
23.5	49.05	9.81	14.78	45.69	9.18	15.22	27.73	4.5	25.96	4.21	16.94	2.4	15.86	2.25	22.0	3.18	20.58	2.95	32.2	32.2	36.14	3.44
24.	50.1	10.0	15.1	46.67	9.36	15.55	28.4	4.6	26.57	4.3	17.30	2.45	16.2	2.3	22.5	3.26	20.1	3.0	33.0	33.0	37.6	3.5
24.5	51.15	10.22	15.42	47.66	9.54	15.83	28.96	4.7	27.05	4.39	17.7	2.49	16.51	2.35	23.	3.32	21.45	3.06	33.62	33.62	37.7	3.55
25.	52.2	10.44	15.74	48.64	9.73	16.2	29.6	4.8	27.65	4.48	18.08	2.53	16.87	2.4	23.5	3.4	21.9	3.12	34.4	34.4	38.5	3.61
25.5	53.3	10.66	16.06	49.62	9.93	16.5	30.16	4.89	28.2	4.57	18.43	2.59	17.2	2.45	23.9	3.46	22.33	3.18	35.05	34.05	39.3	3.7
26.	54.35	10.87	16.38	50.6	10.13	16.86	30.8	4.99	28.8	4.66	18.82	2.64	17.55	2.5	24.45	3.51	22.8	3.26	35.8	35.8	40.1	3.8
26.5	55.43	11.08	16.7	51.60	10.33	17.18	31.38	5.8	29.32	4.75	19.25	2.69	17.9	2.55	24.9	3.58	23.25	3.31	36.5	36.5	40.85	3.88
27.	56.5	11.3	17.0	52.61	10.54	17.51	32.04	5.17	29.98	4.84	19.58	2.75	18.28	2.6	25.4	3.65	23.7	3.36	37.24	37.24	41.7	3.95
27.5	57.55	11.55	17.31	53.58	10.74	17.8	32.58	5.26	30.45	4.93	19.9	2.79	18.6	2.65	25.3	3.72	24.1	3.43	37.86	37.86	42.4	4.0
28.	58.6	11.7	17.63	54.55	10.94	18.2	33.2	5.36	31.04	5.02	20.32	2.85	18.98	2.7	26.35	3.8	24.6	3.5	38.55	38.55	43.2	4.09
28.5	59.65	11.83	17.94	55.53	11.1	18.5	33.76	5.45	31.55	5.1	20.6	2.9	19.26	2.75	26.75	3.85	25.0	3.56	39.25	39.25	43.95	4.15
29.	60.7	12.14	18.25	56.5	11.32	18.82	34.38	5.55	32.1	5.18	21.0	2.95	19.6	2.8	27.2	3.92	25.45	3.61	39.9	39.9	44.72	4.22
29.5	61.75	12.35	18.56	57.48	11.5	19.1	34.93	5.65	32.62	5.27	21.32	3.0	19.9	2.85	27.65	4.0	25.85	3.66	40.58	40.58	45.48	4.3
30.	62.81	12.56	18.86	58.45	11.7	19.48	35.54	5.75	33.25	5.36	21.72	3.05	20.3	2.9	28.2	4.6	26.32	3.74	41.3	41.3	46.25	4.37

[Fig. 31, Pl. I.

BARQUES, 1st *Example;* YARDS, &c.

[Fig. 32, Pl. I.

Dimensions of Ship.	Main-yards.								Fore-yards.								Driver-boom.	Gaff.	Top-sail-gaff.	Main try-sail-gaff.	Fore try-sail-gaff.	Sprit-sail-yard.	Arm.	Swing-boom.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.								
70	35.0	1.4	26.35	2.1	17.0	0.65	12.6	0.45	31.8	1.25	24.0	2.0	15.45	0.66	11.6	0.48	26.35	19.35	11.6	12.25	12.9	24.0	1.0	23.1
71	35.5	1.42	26.75	2.13	17.2	0.66	12.8	0.46	32.25	1.27	24.35	2.02	15.65	0.67	11.75	0.49	26.75	19.65	11.75	12.4	13.1	24.35	1.01	23.35
72	36.0	1.44	27.1	2.6	17.4	0.67	13.0	0.47	32.7	1.29	24.7	2.05	15.9	0.68	11.9	0.49	27.1	19.9	11.9	12.6	13.3	24.7	1.03	23.7
73	36.5	1.46	27.5	2.2	17.65	0.68	13.15	0.48	33.15	1.31	25.05	2.08	16.1	0.69	12.05	0.5	27.5	20.15	12.05	12.75	13.45	25.05	1.04	24.05
74	37.0	1.48	27.9	2.24	17.9	0.69	13.3	0.49	33.63	1.33	25.4	2.11	16.32	0.69	12.25	0.51	27.9	20.45	12.25	12.95	13.65	25.4	1.05	24.42
75	37.5	1.5	28.25	2.28	18.15	0.70	13.5	0.50	34.1	1.35	25.75	2.14	16.55	0.69	12.4	0.51	28.25	20.75	12.4	13.1	13.85	25.75	1.06	24.75
76	38.0	1.52	28.65	2.32	18.4	0.71	13.7	0.51	34.55	1.37	26.05	2.17	16.8	0.7	12.55	0.52	28.65	21.0	12.55	13.3	14.05	26.05	1.07	25.08
77	38.5	1.54	29.05	2.36	18.65	0.72	13.9	0.52	35.0	1.39	26.35	2.2	17.05	0.71	12.75	0.53	29.05	21.3	12.75	13.5	14.2	26.35	1.08	25.4
78	39.0	1.56	29.4	2.39	18.9	0.73	14.1	0.53	35.4	1.41	26.75	2.21	17.25	0.71	12.9	0.53	29.4	21.55	12.9	13.65	14.4	26.75	1.09	25.75
79	39.5	1.58	29.8	2.42	19.15	0.74	14.25	0.54	35.9	1.43	27.1	2.23	17.45	0.71	13.1	0.54	29.8	21.9	13.1	13.85	14.6	27.1	1.1	26.1
80	40.0	1.6	30.2	2.45	19.4	0.75	14.45	0.55	36.3	1.45	27.4	2.25	17.65	0.72	13.25	0.55	30.2	22.15	13.25	14.05	14.75	27.4	1.12	26.4
81	40.5	1.62	30.6	2.48	19.65	0.76	14.6	0.56	36.8	1.47	27.75	2.27	17.85	0.73	13.4	0.55	30.6	22.4	13.4	14.2	14.95	27.75	1.14	26.75
82	41.0	1.64	31.0	2.51	19.9	0.77	14.8	0.57	37.25	1.49	28.1	2.29	18.1	0.74	13.55	0.56	31.0	22.7	13.55	14.35	15.1	28.1	1.16	27.06
83	41.5	1.66	31.35	2.54	20.1	0.78	15.0	0.58	37.7	1.51	28.45	2.32	18.3	0.75	13.75	0.56	31.35	22.95	13.75	14.55	15.3	28.45	1.18	27.4
84	42.0	1.68	31.70	2.57	20.4	0.79	15.2	0.59	38.15	1.53	28.8	2.35	18.55	0.76	13.9	0.57	31.70	23.25	13.9	14.7	15.5	28.8	1.2	27.75
85	42.5	1.7	32.05	2.6	20.6	0.80	15.3	0.60	38.6	1.55	29.15	2.37	18.75	0.77	14.05	0.57	32.05	23.55	14.05	14.9	15.7	29.15	1.21	28.1
86	43.0	1.72	32.45	2.63	20.85	0.81	15.5	0.61	39.1	1.57	29.5	2.39	19.05	0.78	14.25	0.58	32.45	23.85	14.25	15.05	15.9	29.5	1.22	28.35
87	43.45	1.74	32.85	2.66	21.1	0.82	15.7	0.62	39.5	1.59	29.85	2.42	19.25	0.79	14.4	0.59	32.85	24.1	14.4	15.25	16.05	29.85	1.24	28.7
88	43.95	1.76	33.2	2.69	21.3	0.83	15.9	0.63	39.95	1.61	30.25	2.45	19.45	0.80	14.55	0.60	33.2	24.35	14.55	15.45	16.25	30.25	1.26	29.0
89	44.45	1.78	33.6	2.72	21.55	0.84	16.08	0.64	40.4	1.63	30.55	2.47	19.65	0.81	14.75	0.61	33.6	24.65	14.75	15.6	16.45	30.55	1.27	29.3
90	45.0	1.8	33.95	2.75	21.8	0.85	16.23	0.65	40.85	1.65	30.85	2.5	19.9	0.82	14.9	0.62	33.95	24.9	14.9	15.75	16.6	30.85	1.28	29.6
91	45.5	1.82	34.35	2.78	22.05	0.86	16.4	0.65	41.3	1.67	31.2	2.53	20.1	0.83	15.1	0.62	34.35	25.2	15.1	15.95	16.8	31.2	1.3	30.
92	46.0	1.84	34.7	2.81	22.3	0.88	16.6	0.66	41.8	1.69	31.55	2.56	20.35	0.84	15.3	0.63	34.7	25.5	15.3	16.1	17.0	31.55	1.31	30.3
93	46.45	1.86	35.1	2.84	22.55	0.9	16.8	0.66	42.25	1.71	31.9	2.59	20.6	0.85	15.45	0.63	35.1	25.7	15.45	16.3	17.15	31.9	1.32	30.6
94	46.95	1.88	35.45	2.87	22.8	0.91	17.0	0.67	42.7	1.73	32.25	2.62	20.8	0.86	15.6	0.64	35.45	26.0	15.6	16.5	17.35	32.25	1.34	30.9
95	47.4	1.9	35.85	3.0	23.05	0.92	17.15	0.67	43.1	1.75	32.55	2.65	21.0	0.87	15.75	0.65	35.85	26.3	15.75	16.65	17.55	32.55	1.36	31.2
96	47.95	1.92	36.2	3.02	23.3	0.93	17.3	0.68	43.6	1.77	32.95	2.68	21.25	0.88	15.9	0.65	36.2	26.6	15.9	16.8	17.7	32.95	1.37	31.5
97	48.4	1.94	36.6	3.05	23.55	0.94	17.5	0.68	44.05	1.79	33.25	2.71	21.45	0.88	16.1	0.66	36.6	26.85	16.1	16.98	17.9	33.25	1.38	31.8

Barques, 1st *Example (Continued).*

[Fig. 32, Pl. I.

Dimensions of Ship.	Main-yards.								Fore-yards.								Driver-boom.	Gaff.	Top-sail-gaff.	Main try-sail-gaff.	Fore try-sail-gaff.	Sprit-sail-yard.	Arm.	Swing-boom.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.								
98	48.95	1.96	37.0	3.07	23.75	0.96	17.7	0.69	44.5	1.81	33.55	2.74	21.7	0.89	16.25	0.67	37.0	27.1	16.25	17.15	18.1	33.55	1.4	32.1
99	49.45	1.98	37.35	3.09	24.0	0.98	17.9	0.69	45.0	1.83	33.95	2.77	21.9	0.9	16.4	0.68	37.35	27.4	16.4	17.35	18.3	33.95	1.42	32.4
100	50.0	2.0	37.75	3.1	24.25	1.0	18.05	0.70	45.4	1.85	34.3	2.8	22.1	0.91	16.6	0.68	37.75	27.7	16.6	17.5	18.5	34.3	1.43	32.75
101	50.45	2.02	38.1	3.12	24.5	1.01	18.25	0.70	45.9	1.87	34.65	2.83	22.33	0.92	16.75	0.69	38.1	27.95	16.75	17.7	18.65	34.65	1.44	33.0
102	51.0	2.05	38.5	3.15	24.7	1.02	18.4	0.71	46.3	1.89	35.0	2.86	22.58	0.93	16.9	0.7	38.5	28.25	16.9	17.8	18.8	35.0	1.45	33.35
103	51.45	2.07	38.88	3.18	24.95	1.03	18.6	0.72	46.8	1.91	35.35	2.89	22.75	0.94	17.05	0.71	38.88	28.5	17.05	18.05	19.05	35.35	1.47	33.65
104	52.0	2.09	39.25	3.2	25.2	1.04	18.75	0.73	47.2	1.93	35.65	2.93	23.0	0.95	17.2	0.71	39.25	28.8	17.2	18.2	19.2	35.65	1.48	34.0
105	52.45	2.11	39.65	3.23	25.45	1.04	18.95	0.74	47.7	1.95	36.05	2.97	23.2	0.96	17.4	0.72	39.65	29.1	17.4	18.35	19.35	36.05	1.49	34.3
106	53.0	2.15	40.0	3.26	25.7	1.05	19.1	0.75	48.1	1.97	36.35	3.02	23.4	0.97	17.55	0.73	40.0	29.3	17.55	18.55	19.6	36.35	1.51	34.6
107	53.45	2.18	40.4	3.29	25.95	1.06	19.3	0.76	48.6	1.99	36.73	3.06	23.65	0.98	17.7	0.74	40.4	29.6	17.7	18.75	19.75	36.73	1.53	34.9
108	54.0	2.2	40.8	3.32	26.2	1.07	19.5	0.77	49.14	2.04	37.12	3.09	23.92	0.99	17.94	0.75	40.8	30.0	17.94	18.95	19.95	37.12	1.54	35.2
109	54.45	2.22	41.15	3.35	26.4	1.08	19.65	0.78	49.55	2.04	37.4	3.12	24.12	1.0	18.1	0.75	41.15	30.3	18.1	19.1	20.1	37.4	1.56	35.5
110	55.0	2.25	41.55	3.37	26.7	1.09	19.85	0.79	50.05	2.06	37.75	3.14	24.3	1.01	18.25	0.76	41.55	30.6	18.25	19.3	20.32	37.75	1.57	35.8
111	55.5	2.28	41.9	3.40	26.9	1.09	20.05	0.80	50.45	2.07	38.1	3.17	24.55	1.02	18.4	0.76	41.9	30.9	18.4	19.45	20.5	38.1	1.58	36.15
112	56.0	2.31	42.25	3.43	27.15	1.1	20.2	0.82	50.9	2.09	38.45	3.2	24.8	1.03	18.6	0.77	42.25	31.1	18.6	19.65	20.7	38.45	1.59	36.45
113	56.5	2.33	42.65	3.48	27.4	1.1	20.4	0.83	51.3	2.11	38.8	3.23	25.05	1.04	18.75	0.78	42.65	31.3	18.75	19.8	20.9	38.8	1.61	36.75
114	57.0	2.35	43.05	3.52	27.65	1.12	20.6	0.84	51.8	2.13	39.1	3.26	25.2	1.05	18.9	0.78	43.05	31.6	18.9	20.0	21.05	39.1	1.62	37.05
115	57.5	2.38	43.4	3.55	27.9	1.12	20.8	0.85	52.2	2.15	39.45	3.29	25.4	1.06	19.1	0.79	43.4	31.85	19.1	20.15	21.25	39.45	1.64	37.4
116	58.0	2.41	43.8	3.58	28.1	1.13	21.0	0.86	52.7	2.17	39.85	3.32	25.65	1.07	19.25	0.8	43.8	32.15	19.25	20.35	21.45	39.85	1.66	37.7
117	58.5	2.43	44.2	3.61	28.4	1.13	21.15	0.87	53.15	2.19	40.2	3.35	25.9	1.08	19.45	0.81	44.2	32.45	19.45	20.5	21.65	40.2	1.68	38.
118	59.0	2.45	44.55	3.64	28.65	1.14	21.30	0.88	53.65	2.21	40.55	3.36	26.1	1.09	19.6	0.81	44.55	32.7	19.6	20.7	21.8	40.55	1.7	38.3
119	59.5	2.47	44.95	3.67	28.9	1.15	21.5	0.89	54.1	2.23	40.85	3.4	26.3	1.1	19.75	0.82	44.95	33.0	19.75	20.9	22.0	40.85	1.71	38.6
120	60.0	2.5	45.3	3.7	29.1	1.16	21.7	0.90	54.55	2.25	41.2	3.45	26.55	1.11	19.95	0.83	45.3	33.25	19.95	21.05	22.2	41.2	1.72	38.9
121	60.5	2.52	45.7	3.73	29.35	1.17	21.9	0.91	55.05	2.27	41.55	3.45	26.8	1.12	20.1	0.83	45.7	33.55	20.1	21.25	22.35	41.55	1.73	39.25
122	61.0	2.54	46.05	3.77	29.6	1.18	22.05	0.92	55.5	2.29	41.9	3.47	27.0	1.13	20.25	0.84	46.05	33.85	20.25	21.45	22.55	41.9	1.75	39.6
123	61.5	2.56	46.45	3.8	30.0	1.19	22.25	0.93	56.0	2.31	42.25	3.48	27.2	1.14	20.4	0.85	46.45	34.1	20.4	21.6	22.75	42.25	1.76	39.9
124	62.0	2.58	46.83	3.83	30.2	1.2	22.4	0.94	56.4	2.33	42.6	3.49	27.45	1.14	20.6	0.85	46.83	34.4	20.6	21.75	22.95	42.6	1.78	40.2
125	62.5	2.6	47.2	3.87	30.45	1.21	22.6	0.95	56.85	2.35	42.95	3.5	27.7	1.15	20.75	0.86	47.2	34.7	20.75	21.95	23.1	42.95	1.78	40.5

BARQUES, 1*st Example;* Masts, &c.

[Fig. 32, Pl. I.

Dimensions of Ship.	Lower-masts.									Top-masts.						Top-gallant-masts.				Bowsprit.	Jib-boom.	Flying-jib-boom.
	Fore.			Main.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.				
Breadth.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Hounded	Headed.	Hounded	Pole.	Hounded	Pole.	Hounded	Pole.			
18.	39.55	7.94	12.9	35.6	7.18	12.15	29.0	4.6	5.15	22.6	3.6	20.35	3.3	19.6	5.15	13.25	11.06	12.0	10.0	25.8	22.2	2.0
18.5	40.6	8.15	13.25	36.6	7.35	12.5	29.8	4.78	5.3	23.2	3.68	20.9	3.38	20.15	5.3	13.6	11.38	12.23	10.2	26.5	22.8	2.05
19.	41.75	8.38	13.6	37.55	7.59	12.8	30.6	4.9	5.45	23.9	3.79	21.45	3.48	20.65	5.45	13.95	11.7	12.55	10.45	27.2	23.4	2.1
19.5	42.85	8.6	14.0	38.6	7.78	13.2	31.4	5.05	5.6	24.5	3.88	22.05	3.58	21.2	5.6	14.35	12.03	12.9	10.8	28.0	24.05	2.13
20.	43.9	8.8	14.3	39.55	7.95	13.5	32.1	5.15	5.75	25.1	4.0	22.6	3.65	21.8	5.75	14.65	12.3	13.2	11.05	28.65	24.65	2.17
20.5	44.53	9.05	14.8	40.55	8.15	13.9	33.0	5.28	5.9	25.75	4.1	23.2	3.75	22.3	5.9	15.05	12.6	13.55	11.3	29.4	25.3	2.2
21.	46.15	9.28	15.05	41.55	8.36	14.2	33.8	5.4	6.05	26.4	4.2	23.75	3.85	22.88	6.05	15.45	12.9	13.9	11.6	30.15	26.0	2.23
21.5	47.2	9.5	15.4	42.52	8.55	14.5	34.6	5.55	6.2	27.0	4.3	24.3	3.93	23.35	6.2	15.85	13.23	14.2	11.9	30.85	26.5	2.26
22.	48.3	9.7	15.7	43.55	8.72	14.85	35.4	5.68	6.35	27.6	4.4	24.9	3.98	23.95	6.35	16.2	13.55	14.57	12.17	31.55	27.15	2.3
22.5	49.45	9.9	16.1	44.5	8.95	15.2	36.2	5.8	6.5	28.3	4.5	25.4	4.08	24.5	6.5	16.6	13.88	14.9	12.45	32.3	27.78	2.36
23.	50.55	10.15	16.5	45.55	9.1	15.55	37.0	5.94	6.65	28.9	4.6	26.05	4.2	25.05	6.65	16.95	14.12	15.2	12.7	33.05	28.4	2.43
23.5	51.58	10.37	16.85	46.5	9.3	15.85	37.8	6.05	6.75	29.5	4.7	26.6	4.28	25.6	6.75	17.3	14.45	15.55	13.0	33.7	28.95	2.5
24.	52.65	10.55	17.2	47.45	9.5	16.2	38.6	6.18	6.9	30.1	4.8	27.1	4.36	26.1	6.9	17.65	14.75	15.9	13.25	34.4	29.6	2.54
24.5	53.77	10.8	17.52	48.4	9.7	16.55	39.4	6.3	7.05	30.8	4.9	27.7	4.45	26.65	7.05	18.03	15.05	16.2	13.51	35.1	30.2	2.61
25.	54.95	11.02	17.9	49.4	9.9	16.9	40.0	6.43	7.2	31.4	5.0	28.25	4.57	27.2	7.2	18.38	15.35	16.55	13.8	35.8	30.9	2.68
25.5	56.0	11.2	18.25	50.4	10.1	17.2	41.25	6.57	7.3	32.0	5.1	28.85	4.65	27.75	7.3	18.8	15.7	16.9	14.05	36.6	31.45	2.72
26.	57.1	11.45	18.6	51.3	10.3	17.55	41.85	6.7	7.45	32.65	5.2	29.4	4.73	28.3	7.45	19.1	16.05	17.2	14.35	37.25	32.05	2.78
26.5	58.2	11.65	19.0	52.4	10.5	17.9	42.7	6.85	7.63	33.3	5.3	30.0	4.83	28.85	7.63	19.5	16.3	17.55	14.65	38.0	32.7	2.82
27.	59.25	11.9	19.3	53.4	10.7	18.2	43.5	7.0	7.76	33.95	5.4	30.55	4.93	29.38	7.76	19.9	16.6	17.9	14.95	38.7	33.3	2.89
27.5	60.34	12.1	19.65	54.3	10.9	18.55	44.2	7.1	7.9	34.6	5.5	31.1	5.04	30.0	7.9	20.2	17.0	18.2	15.2	39.4	33.9	2.93
28.	61.5	12.34	20.05	55.35	11.1	18.9	45.05	7.25	8.05	35.2	5.6	31.7	5.1	30.55	8.05	20.65	17.25	18.55	15.5	40.2	34.6	3.03
28.5	62.6	12.65	20.45	56.4	11.3	19.25	45.85	7.35	8.2	35.8	5.7	32.25	5.2	31.05	8.2	21.05	17.55	18.9	15.8	40.9	35.2	3.07
29.	63.7	12.75	20.8	57.35	11.5	19.58	46.65	7.5	8.35	36.5	5.8	32.85	5.28	31.6	8.35	21.35	17.85	19.2	16.05	41.6	35.8	3.1
29.5	64.8	13.0	21.1	58.3	11.7	19.9	47.45	7.6	8.5	37.1	5.9	33.4	5.35	32.1	8.5	21.75	18.2	19.55	16.35	42.35	36.35	3.13
30.	65.95	13.2	21.5	59.3	11.9	20.25	48.25	7.75	8.65	37.7	6.0	33.95	5.45	32.68	8.65	22.1	18.5	19.9	16.6	43.05	37.0	3.2
30.5	67.05	13.43	21.85	60.3	12.1	20.6	49.05	7.88	8.8	38.4	6.1	34.5	5.53	33.25	8.8	22.5	18.8	20.2	16.9	43.75	37.62	3.25
31.	68.1	13.64	22.2	61.15	12.25	20.9	49.8	7.98	8.9	39.0	6.2	35.05	5.6	33.7	8.9	22.8	19.05	20.55	17.1	44.35	38.18	3.3
31.5	69.15	13.85	22.55	62.2	12.48	21.2	50.6	8.1	9.05	39.55	6.3	35.55	5.7	34.25	9.05	23.2	19.4	20.9	17.4	45.1	38.8	3.35
32.	70.3	14.05	22.9	63.2	12.65	21.6	51.45	8.25	9.2	40.2	6.4	36.15	5.8	34.85	9.2	23.55	19.7	21.2	17.66	45.9	39.45	3.4
32.5	71.35	14.3	23.25	64.15	12.75	21.9	52.2	8.38	9.3	40.8	6.5	36.7	5.88	35.35	9.3	23.9	20.0	21.55	17.95	46.55	40.05	3.45
33.	72.55	14.5	23.65	65.2	13.08	22.25	53.1	8.5	9.45	41.5	6.6	37.3	5.97	35.95	9.45	24.3	20.3	21.9	18.25	47.3	40.68	3.5
33.5	73.6	14.75	24.0	66.2	13.2	22.6	53.9	8.65	9.63	42.1	6.7	37.9	6.05	36.45	9.63	24.7	20.65	22.2	18.53	48.05	41.3	3.55
34.	74.7	14.95	24.35	67.2	13.48	22.95	54.7	8.8	9.75	42.75	6.8	38.45	6.15	37.05	9.75	25.05	20.95	22.55	18.8	48.8	41.95	3.65
34.5	75.75	15.18	24.7	68.15	13.64	23.3	55.4	8.9	9.9	43.3	6.9	39.0	6.23	37.55	9.9	25.38	21.24	22.9	19.05	49.4	42.5	3.7
35.	76.8	15.4	25.05	69.1	13.83	23.6	56.2	9.05	10.05	43.9	7.0	39.55	6.3	38.05	10.05	25.75	21.55	23.2	19.36	50.1	43.1	3.75

BARQUES, *2nd Example;* YARDS &c. [Fig. 32, Pl. I.

Length of Ship.	MAIN-YARDS.								FORE-YARDS.								Driver-boom.	Gaff.	Top-sail-gaff.	Main try-sail-gaff.	Fore try-sail-gaff.	Sprit-sail-yard.	Arm.	Swing-boom.
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.								
70	37.7	1.57	29.1	2.42	18.9	0.78	13.65	0.56	35.7	1.47	27.65	2.30	18.15	0.75	13.1	0.54	25.8	16.35	10.9	11.6	12.7	27.65	1.15	22.62
71	38.2	1.6	29.5	2.46	19.15	0.79	13.85	0.57	36.25	1.49	28.05	2.33	18.4	0.76	13.3	0.55	26.2	16.55	11.05	11.75	12.9	28.05	1.16	22.92
72	38.75	1.62	30.05	2.5	19.45	0.81	14.05	0.58	36.8	1.51	28.4	2.36	18.65	0.77	13.5	0.56	26.6	16.8	11.2	11.9	13.05	28.4	1.18	23.25
73	39.25	1.64	30.45	2.53	19.7	0.82	14.25	0.59	37.28	1.54	28.8	2.4	18.9	0.78	13.7	0.57	26.9	17.05	11.32	12.05	13.25	28.8	1.2	23.55
74	39.8	1.66	30.85	2.57	20.0	0.83	14.45	0.6	37.8	1.57	29.2	2.43	19.15	0.79	13.85	0.57	27.3	17.25	11.5	12.25	13.45	29.2	1.21	23.85
75	40.35	1.68	31.2	2.6	20.25	0.84	14.65	0.61	38.3	1.60	29.65	2.47	19.4	0.80	14.05	0.58	27.7	17.5	11.65	12.4	13.65	29.65	1.23	24.21
76	40.9	1.7	31.65	2.63	20.55	0.85	14.85	0.62	38.82	1.62	30.1	2.50	19.7	0.81	14.2	0.59	28.1	17.75	11.8	12.55	13.8	30.1	1.25	24.54
77	41.35	1.73	32.1	2.67	20.8	0.86	15.05	0.63	39.35	1.64	30.48	2.54	19.98	0.83	14.4	0.6	28.4	18.0	12.0	12.75	14.0	30.48	1.27	24.81
78	41.95	1.75	32.5	2.7	21.1	0.87	15.25	0.64	39.85	1.66	30.88	2.57	20.23	0.84	14.6	0.61	28.8	18.2	12.15	12.9	14.15	30.88	1.28	25.17
79	42.5	1.77	32.9	2.74	21.35	0.88	15.45	0.64	40.38	1.68	31.2	2.60	20.5	0.85	14.8	0.62	29.15	18.45	12.3	13.1	14.35	31.2	1.30	25.50
80	43.05	1.79	33.3	2.77	21.65	0.89	15.65	0.65	40.86	1.7	31.6	2.63	20.75	0.86	15.0	0.62	29.55	18.7	12.45	13.25	14.55	31.6	1.31	25.83
81	43.6	1.81	33.75	2.8	21.9	0.91	15.85	0.66	41.35	1.72	31.98	2.66	21.05	0.87	15.15	0.63	30. 0	18.9	12.6	13.4	14.7	31.98	1.33	26.16
82	44.1	1.84	34.15	2.84	22.15	0.92	16.05	0.67	41.88	1.74	32.38	2.69	21.25	0.88	15.35	0.64	30.35	19.15	12.75	13.55	14.92	32.38	1.34	26.48
83	44.65	1.86	34.6	2.88	22.4	0.93	16.25	0.67	42.4	1.76	32.78	2.73	21.5	0.89	15.55	0.65	30.7	19.4	12.9	13.75	15.1	32.78	1.36	26.79
84	45.2	1.88	35.0	2.91	22.7	0.94	16.45	0.68	42.9	1.78	33.2	2.76	22.78	0.90	15.7	0.66	31.05	19.65	13.05	13.9	15.25	33.2	1.38	27.12
85	45.7	1.9	35.4	2.94	23.0	0.95	16.65	0.69	43.4	1.8	33.55	2.79	22.05	0.91	15.9	0.66	31.35	19.85	13.2	14.05	15.45	33.55	1.39	27.42
86	46.25	1.92	35.8	2.97	23.25	0.96	16.85	0.70	44.0	1.82	33.95	2.82	22.3	0.92	16.1	0.67	31.75	20.1	13.35	14.25	15.65	33.95	1.41	27.75
87	46.8	1.95	36.2	3.01	23.5	0.97	17.0	0.70	44.4	1.84	34.35	2.86	22.55	0.93	16.3	0.68	32.1	20.3	13.5	14.4	15.8	34.35	1.43	28.08
88	47.35	1.97	36.6	3.05	23.8	0.99	17.2	0.71	45.0	1.86	34.75	2.89	22.82	0.95	16.5	0.69	32.5	20.55	13.7	14.55	16.0	34.75	1.44	28.41
89	47.85	1.99	37.05	3.08	24.1	1.	17.4	0.72	45.45	1.88	35.1	2.92	23.1	0.96	16.7	0.69	32.85	20.8	13.85	14.75	16.15	35.1	1.46	28.71
90	48.4	2.01	37.45	3.12	24.3	1.01	17.6	0.73	45.95	1.91	35.55	2.96	23.33	0.97	16.85	0.7	33.2	21.05	14.0	14. 9	16.35	35.55	1.48	29.04
91	49.0	2.03	37.9	3.15	24.6	1.02	17.8	0.74	46.48	1.93	35.95	2.99	23.6	0.98	17.05	0.71	33.6	21.25	14.15	15.1	16.55	35.95	1.49	29.40
92	49.5	2.04	38.3	3.19	24.88	1.03	18.0	0.75	46.98	1.95	36.3	3.02	23.85	0.99	17.2	0.71	34.0	21.5	14.3	15.3	16.7	36.3	1.51	29.70
93	50.05	2.06	38.7	3.21	25.12	1.04	18.2	0.75	47.5	1.97	36.7	3.05	24.1	1.0	17.4	0.72	34.35	21.75	14.45	15.45	16.9	36.7	1.52	30.03
94	50.55	2.08	39.1	3.25	25.36	1.05	18.4	0.76	48.0	2.0	37.1	3.09	24.38	1.01	17.6	0.73	34.7	22.0	14.6	15.6	17.1	37.1	1.54	30.33
95	51.1	2.12	39.5	3.29	25.68	1.06	18.6	0.77	48.5	2.02	37. 5	3.12	24.6	1.02	17.8	0.74	35.1	22.2	14.75	15.75	17.25	37.5	1.56	30.66
96	51.6	2.15	40.0	3.33	25.95	1.07	18.8	0.78	49.0	2.04	37. 9	3.15	24.9	1.03	18.0	0.75	35.5	22.43	15.0	15.9	17.45	37.9	1.57	30.96
97	52.15	2.18	40.4	3.36	26. 2	1.09	19.0	0.79	49.5	2.06	38. 3	3.19	25.1	1.04	18.15	0.75	35.85	22.7	15.1	16.1	17.6	38.3	1.59	31.29

Barques, 2nd Example (*Continued*).

[Fig. 32, Pl. I.

Length of Ship.	Main-yards.								Fore-yards.								Driver-boom.	Gaff.	Top-sail-gaff.	Main try-sail-gaff.	Fore try-sail-gaff.	Sprit-sail-yard.	Arm.	Swing-boom.
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.								
98	52.7	2.2	40.8	3.4	26.45	1.1	19.2	0.80	50.05	2.08	38.7	3.22	25.4	1.05	18.3	0.76	36.2	22.9	15.25	16.25	17.8	38.7	1.61	31.62
99	53.3	2.22	41.2	3.43	26.75	1.11	19.4	0.80	50.55	2.1	39.1	3.25	25.65	1.06	18.5	0.77	36.6	23.1	15.4	16.4	18.0	39.1	1.62	31.98
100	53.8	2.24	41.6	3.46	27.05	1.12	19.6	0.81	51.1	2.12	39.5	3.29	25.9	1.07	18.7	0.77	37.0	23.36	15.55	16.6	18.15	39.5	1.64	32.28
101	54.35	2.26	42.1	3.5	27.3	1.13	19.8	0.82	51.6	2.14	39.9	3.32	26.2	1.08	18.9	0.78	37.3	23.6	15.7	16.75	18.3	39.9	1.66	32.61
102	54.9	2.28	42.45	3.54	27.55	1.14	20.0	0.83	52.1	2.16	40.30	3.35	26.4	1.1	19.1	0.79	37.65	23.85	15.85	16.9	18.5	40.30	1.67	32.94
103	55.4	2.3	42.85	3.57	27.8	1.15	20.15	0.84	52.6	2.18	40.68	3.39	26.7	1.11	19.25	0.80	38.0	24.1	16.0	17.05	18.7	40.68	1.69	33.24
104	55.95	2.32	43.25	3.6	28.05	1.16	20.3	0.84	53.1	2.2	41.05	3.42	26.95	1.12	19.45	0.81	38.35	24.3	16.15	17.2	18.9	41.05	1.71	33.57
105	56.45	2.34	43.7	3.64	28.35	1.17	20.5	0.85	53.6	2.22	41.45	3.45	27.2	1.13	19.65	0.82	38.75	24.5	16.3	17.4	19.05	41.45	1.72	33.87
106	57.05	2.36	44.1	3.67	28.62	1.18	20.7	0.86	54.13	2.24	41.85	3.48	27.5	1.14	19.85	0.82	39.1	24.75	16.45	17.55	19.25	41.85	1.74	34.23
107	57.6	2.38	44.5	3.7	28.9	1.2	20.9	0.86	54.65	2.26	42.25	3.52	27.75	1.15	20.05	0.83	39.5	25.0	16.6	17.7	19.45	42.25	1.76	34.54
108	58.1	2.4	44.9	3.74	29.2	1.21	21.1	0.87	55.2	2.28	42.65	3.55	28.0	1.16	20.25	0.84	39.9	25.2	16.8	17.94	19.6	42.65	1.77	34.86
109	58.65	2.43	45.4	3.78	29.45	1.22	21.3	0.88	55.7	2.31	43.05	3.58	28.25	1.17	20.4	0.85	40.25	25.45	17.0	18.1	19.8	43.05	1.79	35.19
110	59.2	2.46	45.8	3.82	29.7	1.23	21.5	0.89	56.2	2.34	43.45	3.62	28.5	1.18	20.6	0.86	40.6	25.7	17.1	18.25	20.0	43.45	1.81	35.52
111	59.7	2.48	46.2	3.85	30.05	1.24	21.7	0.9	56.7	2.36	43.85	3.65	28.75	1.19	20.8	0.86	41.0	25.95	17.25	18.4	20.2	43.85	1.82	35.82
112	60.35	2.51	46.6	3.89	30.35	1.25	21.9	0.91	57.2	2.38	44.25	3.68	29.05	1.2	21.0	0.87	41.35	26.15	17.4	18.6	20.35	44.25	1.84	36.21
113	60.9	2.54	47.1	3.92	30.6	1.26	22.1	0.92	57.7	2.41	44.65	3.72	29.3	1.21	21.2	0.88	41.7	26.4	17.55	18.75	20.55	44.65	1.86	36.54
114	61.4	2.56	47.5	3.95	30.9	1.27	22.3	0.92	58.25	2.43	45.05	3.75	29.55	1.22	21.35	0.89	42.1	26.65	17.7	18.9	20.7	45.05	1.87	36.84
115	62.0	2.58	47.9	3.99	31.1	1.28	22.5	0.93	58.75	2.45	45.45	3.78	29.83	1.24	21.55	0.89	42.45	26.85	17.9	19.1	20.9	45.45	1.89	37.2
116	62.5	2.60	48.3	4.02	31.25	1.29	22.7	0.94	59.3	2.47	45.85	3.82	30.2	1.25	21.75	0.90	42.85	27.1	18.05	19.25	21.1	45.85	1.91	37.5
117	63.1	2.62	48.7	4.05	31.6	1.3	22.9	0.95	59.8	2.49	46.25	3.85	30.4	1.26	21.95	0.91	43.2	27.35	18.2	19.45	21.25	46.25	1.92	37.8
118	63.6	2.64	49.1	4.09	31.9	1.32	23.1	0.96	60.4	2.51	46.65	3.88	30.65	1.27	22.1	0.91	43.55	27.6	18.35	19.6	21.45	46.65	1.94	38.16
119	64.2	2.67	49.5	4.12	32.2	1.33	23.3	0.97	60.9	2.53	47.05	3.92	30.95	1.28	22.3	0.92	44.0	27.85	18.5	19.75	21.65	47.05	1.96	38.46
120	64.7	2.7	49.9	4.15	32.45	1.35	23.5	0.97	61.4	2.55	47.45	3.95	31.15	1.29	22.5	0.93	44.35	28.05	18.7	19.95	21.82	47.45	1.97	38.76
121	65.2	2.72	50.35	4.19	32.7	1.36	23.7	0.98	61.9	2.58	47.85	3.98	31.4	1.3	22.7	0.94	44.7	28.3	18.85	20.1	22.0	47.85	1.99	39.12
122	65.8	2.74	50.8	4.23	33.0	1.37	23.9	0.99	62.4	2.6	48.25	4.02	31.65	1.32	22.85	0.95	45.1	28.5	19.0	20.25	22.15	48.25	2.01	39.48
123	66.3	2.76	51.2	4.26	33.3	1.38	24.1	1.0	62.9	2.62	48.65	4.05	31.9	1.33	23.1	0.96	45.45	28.77	19.15	20.4	22.4	48.65	2.02	39.78
124	66.85	2.78	51.6	4.3	33.55	1.39	24.3	1.02	63.4	2.64	49.05	4.08	32.2	1.34	23.3	0.97	45.85	29.05	19.3	20.6	22.6	49.05	2.04	40.11
125	67.35	2.8	52.1	4.34	33.85	1.4	24.5	1.02	63.9	2.66	49.45	4.12	32.45	1.35	23.45	0.97	46.2	29.23	19.45	20.75	22.75	49.45	2.06	40.41

BARQUES, *2nd Example;* MASTS, &c.

[Fig. 32, Pl. I.

Breadth of Ship.	LOWER-MASTS.									TOP-MASTS.						TOP-GALLANT MASTS.				Bowsprit.	Jib-boom.	Flying-jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.				
	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Hounded	Headed.	Hounded	Pole.	Hounded	Pole.	Hounded	Pole.			
18.	36.0	7.1	8.6	34.2	6.8	8.6	35.8	5.7	8.6	20.6	3.3	19.5	3.1	18.4	4.55	13.6	11.1	13.0	10.0	24.0	22.0	7.28
18.5	37.0	7.3	8.8	35.1	7.0	8.8	36.8	5.85	8.8	21.2	3.43	20.05	3.2	18.9	4.7	14.0	11.35	13.3	10.2	24.65	22.6	7.45
19.	38.0	7.5	9.1	36.05	7.15	9.1	37.8	6.05	9.1	21.75	3.53	20.6	3.3	19.4	4.8	14.35	11.65	13.7	10.5	25.3	23.2	7.7
19.5	39.0	7.7	9.3	37.0	7.35	9.3	38.7	6.2	9.3	22.3	3.63	21.1	3.38	19.9	4.92	14.78	11.95	14.05	10.8	25.95	23.8	7.9
20.	40.0	7.9	9.55	38.0	7.55	9.55	39.7	6.35	9.55	22.9	3.7	21.65	3.45	20.4	5.05	15.1	12.3	14.4	11.05	26.6	24.4	8.1
20.5	41.0	8.1	9.8	39.0	7.7	9.8	40.7	6.5	9.8	23.5	3.8	22.2	3.55	20.95	5.2	15.55	12.6	14.78	11.35	27.3	25.1	8.3
21.	42.0	8.3	10.05	39.9	7.9	10.05	41.7	6.7	10.05	24.1	3.9	22.75	3.63	21.5	5.33	15.95	12.9	15.1	11.6	27.95	25.7	8.5
21.5	43.0	8.5	10.3	40.8	8.1	10.3	42.7	6.85	10.3	24.7	3.98	23.3	3.7	22.	5.42	16.3	13.25	15.5	11.85	28.6	26.3	8.7
22.	44.0	8.7	10.55	41.7	8.3	10.55	43.7	7.0	10.55	25.2	4.03	23.8	3.8	22.5	5.58	16.7	13.53	15.85	12.15	29.3	26.9	8.9
22.5	45.0	8.9	10.75	42.7	8.5	10.75	44.7	7.15	10.75	25.8	4.13	24.4	3.9	23.05	5.69	17.05	13.83	16.2	12.4	29.99	27.5	9.1
23.	46.0	9.1	11.0	43.65	8.7	11.0	45.7	7.35	11.0	26.4	4.25	24.9	4.0	23.55	5.8	17.4	14.15	16.55	12.7	30.7	28.1	9.3
23.5	47.0	9.3	11.25	44.55	8.85	11.25	46.6	7.45	11.25	26.9	4.33	25.4	4.06	24.05	5.92	17.8	14.42	16.9	12.95	31.3	28.7	9.5
24.	48.0	9.5	11.5	45.5	9.05	11.5	47.6	7.65	11.5	27.5	4.41	25.95	4.15	24.55	6.05	18.2	14.75	17.25	13.25	31.9	29.3	9.7
24.5	49.0	9.7	11.75	46.45	9.25	11.75	48.55	7.8	11.75	28.1	4.5	26.5	4.23	25.05	6.2	18.55	15.05	17.6	13.55	32.6	29.99	9.9
25.	50.0	9.9	12.0	47.4	9.45	12.0	49.55	7.95	12.0	28.6	4.62	27.05	4.31	25.55	6.35	18.95	15.4	18.0	13.8	33.3	30.6	10.1
25.5	51.0	10.1	12.25	48.35	9.65	12.25	50.55	8.1	12.25	29.2	4.7	27.65	4.4	26.05	6.47	19.35	15.7	18.35	14.1	33.9	31.2	10.3
26.	52.0	10.3	12.5	49.3	9.85	12.5	51.6	8.3	12.5	29.7	4.78	28.2	4.5	26.55	6.6	19.7	16.0	18.75	14.35	34.6	31.8	10.5
26.5	53.0	10.5	12.75	50.25	10.05	12.75	52.55	8.45	12.75	30.65	4.88	28.7	4.6	27.1	6.7	20.1	16.3	19.1	14.65	35.3	32.3	10.7
27.	54.0	10.7	13.0	51.2	10.25	13.0	53.6	8.6	13.0	31.0	4.98	29.25	4.7	27.6	6.85	20.5	16.6	19.45	14.9	35.9	33.0	10.9
27.5	55.0	10.9	13.25	52.15	10.4	13.25	54.6	8.78	13.25	31.5	5.09	29.85	4.78	28.1	7.05	20.85	16.9	19.8	15.2	36.65	33.6	11.1
28.	56.0	11.1	13.5	53.1	10.6	13.5	55.6	9.0	13.5	32.1	5.15	30.4	4.85	28.65	7.13	21.25	17.25	20.2	15.5	37.3	34.25	11.35
28.5	57.0	11.3	13.75	54.05	10.8	13.75	56.6	9.1	13.75	32.65	5.25	31.0	4.92	29.15	7.25	21.65	17.6	20.6	15.8	37.95	34.85	11.5
29.	58.0	11.5	14.0	55.0	11.0	14.0	57.6	9.25	14.0	33.25	5.33	31.5	5.0	29.7	7.35	22.05	17.85	20.95	16.05	38.65	35.4	11.75
29.5	59.0	11.7	14.2	56.0	11.2	14.2	58.6	9.4	14.2	33.8	5.38	31.95	5.1	30.2	7.5	22.35	18.15	21.3	16.3	39.3	36.05	12.0
30.	60.0	11.9	14.4	57.0	11.4	14.4	59.5	9.55	14.4	34.4	5.5	32.55	5.2	30.7	7.6	22.75	18.45	21.65	16.6	39.9	36.7	12.15
30.5	61.0	12.1	14.65	57.9	11.6	14.65	60.6	9.7	14.65	34.95	5.58	33.1	5.3	31.25	7.75	23.15	18.8	21.98	16.9	40.6	37.3	12.35
31.	62.0	12.3	14.86	58.75	11.8	14.86	61.5	9.85	14.86	35.45	5.65	33.6	5.37	31.7	7.88	23.5	19.05	22.3	17.1	41.2	37.8	12.55
31.5	63.0	12.5	15.1	59.7	12.0	15.1	62.5	10.0	15.1	36.05	5.75	34.15	5.43	32.2	8.0	23.85	19.4	22.7	17.4	41.9	38.45	12.77
32.	64.0	12.7	15.32	60.7	12.15	15.32	63.5	10.15	15.32	36.7	5.85	34.7	5.52	32.7	8.15	24.25	19.7	23.1	17.7	42.55	39.05	12.98
32.5	65.0	12.9	15.6	61.6	12.3	15.6	64.45	10.32	15.6	37.2	5.93	35.15	5.6	33.2	8.25	24.6	19.95	23.4	18.0	43.2	39.65	13.15
33.	66.0	13.1	15.82	62.55	12.48	15.82	65.4	10.5	15.82	37.8	6.02	35.75	5.7	33.75	8.4	25.05	20.3	23.8	18.25	43.9	40.3	13.4
33.5	67.0	13.3	16.1	63.55	12.65	16.1	66.4	10.7	16.1	38.4	6.1	36.3	5.76	34.28	8.5	25.4	20.6	24.15	18.5	44.6	40.9	13.6
34.	68.0	13.5	16.32	64.55	12.9	16.32	67.4	10.85	16.32	38.95	6.2	36.9	5.86	34.8	8.66	25.8	20.95	24.5	18.8	45.3	41.55	13.8
34.5	69.0	13.7	16.5	65.4	13.1	16.5	68.4	11.0	16.5	39.5	6.28	37.4	5.95	35.25	8.73	26.2	21.2	24.88	19.05	45.9	42.1	14.0
35.	70.0	13.9	16.75	66.35	13.25	16.75	69.35	11.15	16.75	40.1	6.35	37.9	6.05	35.8	8.9	26.6	21.55	25.2	19.3	46.5	42.75	14.2

MERCHANT SHIPS; *1st Example.*

Dimensions of Ship.	Main-yards.								Fore-yards.								Mizen-yards.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
120	63.15	2.64	45.65	3.75	30.85	1.28	23.7	1.0	56.9	2.35	41.1	3.39	27.8	1.1	21.35	.9	41.1	1.66	30.3	2.55	20.6	.9	15.78	.65	45.65	33.35	10.	20.05	35.2	41.1	1.66
121	63.7	2.65	46.0	3.77	31.1	1.29	23.87	1.01	57.4	2.37	41.4	3.4	28.	1.12	21.5	.9	41.4	1.68	30.6	2.57	20.75	.9	15.9	.65	46.	33.6	10.1	20.2	35.5	41.4	1.68
122	64.25	2.67	46.35	3.81	31.32	1.30	24.05	1.02	57.85	2.39	41.73	3.43	28.2	1 13	21.7	.91	41.73	1.7	30.9	2.59	20.95	.91	16.05	.66	46.35	33.9	10.2	20.35	35.8	41.73	1.7
123	64.75	2.68	46.72	3.83	31.6	1.31	24.23	1.03	58.3	2.41	42.1	3.47	28.45	1.15	21.85	.91	42.1	1.71	31.15	2.61	21.1	.91	16.15	.67	46.72	34.15	10.25	20.5	36.05	42.1	1.71
124	65.25	2.7	47.1	3.85	31.85	1.32	24.41	1.04	58.8	2.43	42.45	3.5	28.7	1.16	22.05	.92	42.45	1.73	31.4	2.63	21.3	.92	16.3	.67	47.1	34.45	10.33	20.65	36.35	42.45	1.73
125	65.8	2.72	47.5	3.87	32.15	1.33	24.63	1.05	59 3	2.45	42.8	3.54	28.95	1.17	22.2	.92	42.8	1.75	31.65	2.65	21.45	.92	16.45	.68	47.5	34.8	10.4	20.85	36.65	42.8	1.75
126	66.35	2.75	47.9	3.9	32.4	1.34	24.85	1.06	59.8	2.47	43.12	3.58	29.2	1.18	22.4	.93	43.12	1.77	31.9	2.67	21.65	.93	16.55	.68	47.9	35.05	10.5	21.05	36.95	43.12	1.77
127	66.85	2.78	48.25	3.93	32.65	1.35	25.05	1.07	60.25	2.49	43.5	3.60	29.4	1.19	22.55	.93	43.5	1.79	32.15	2.69	21.8	.93	16.7	.69	48.25	35.3	10.6	21.2	37.25	43.5	1.79
128	67.35	2.8	48.65	3.96	32.9	1.36	25.22	1.08	60.7	2.51	43.8	3.64	29.65	1.21	22.7	.94	43.8	1.81	32.4	2.71	22.	.94	16.8	.69	48.65	35.6	10.7	21.35	37.55	43.8	1.81
129	67.9	2.82	49 05	3.99	33.15	1.37	25.45	1.09	61.2	2.53	44.2	3.69	29.9	1.23	22.9	.94	44.2	1.83	32.7	2.73	22.15	.95	16.98	.69	49.05	35.9	10.78	21.5	37.8	44.2	1.83
130	68.4	2.84	49.4	4.1	33.4	1.38	25.65	1.1	61.6	2.55	44.5	3.72	30.1	1.25	23.1	.95	44.5	1.85	33.	2.75	22.3	.95	17.1	.70	49.4	36.15	10.83	21.65	38.1	44.5	1.85
131	68.95	2.86	49.75	4.13	33.65	1.39	25.8	1.12	62.1	2.57	44.83	3.75	30.3	1.26	23.25	.96	44.83	1.87	33.2	2.77	22.45	.95	17.2	.70	49.75	36.4	10.92	21.8	38.4	44.83	1.87
132	69.5	2.88	50.15	4.16	33.95	1.40	26.05	1.13	62.6	2.59	45.2	3.79	30.6	1.27	23.45	.97	45.2	1.88	33.4	2.79	22.65	.96	17.33	.71	50.15	36.7	11.05	22.	38.7	45.2	1.88
133	70.05	2.9	50.6	4.19	34.22	1.41	26.25	1.14	63.1	2.61	45.58	3.82	30.83	1.27	23.65	.98	45.58	1.89	33.7	2.81	22.85	.96	17.5	.71	50.6	37.	11.1	22.2	39.05	45.58	1.89
134	70.6	2.93	50.95	4.22	34.45	1.43	26.43	1.15	63.5	2.63	45.9	3.84	31.05	1.28	23 8	.99	45.9	1.9	33.94	2.83	23.05	.97	17.62	.72	50.95	37.25	11.2	22.35	39.3	45.9	1.9
135	71.05	2.96	51.3	4.25	34.7	1.44	26.62	1.16	64.05	2.65	46.2	3.87	31.3	1.29	24.05	1.	46.2	1.92	34.2	2.85	23.15	.97	17.75	.72	51.3	37.5	11.25	22.5	39.6	46.2	1.92
136	71.6	2.99	51.7	4.29	34.95	1.45	26.8	1.17	64.5	2.67	46.53	3.9	31.5	1.30	24.2	1.01	46.53	1.93	34.45	2.87	23.33	.98	17.85	.72	51.7	37.8	11.35	22.7	39.9	46.53	1.93
137	72.13	3.02	52.1	4.33	35.23	1.46	27.05	1.17	64.98	2.7	46.9	3.93	31.75	1.31	24.35	1.02	46.9	1.94	34.7	2.89	23.55	.98	18.	.73	52.1	38.1	11.45	22.85	40.2	46.9	1.94
138	72.7	3.04	52.5	4.37	35.5	1.47	27.22	1.18	65.45	2.73	47.23	3.96	32.	1.32	24.55	1.03	47.23	1.96	34.95	2.91	23.7	.99	18.15	.74	52.5	38.4	11.5	23.05	40.5	47.23	1.96
139	73.25	3.05	52.88	4.4	35.75	1.48	27.4	1.19	65.95	2.75	47.55	3.99	32.2	1.33	24.7	1.04	47.55	1.98	35.2	2.93	23.88	.99	18.3	.74	52.88	38.7	11.6	23.2	40.75	47.55	1.98
140	73.73	3.06	53.25	4.42	36.	1.49	27.6	1.2	66.4	2.77	47.95	4.02	32.45	1.34	24.9	1.05	47.95	1.99	35.5	2.95	24.05	1.0	18.4	.75	53.25	39.	11.7	23.35	41.05	47.95	1.99
141	74.22	3.08	53.6	4.45	36.25	1.5	27.8	1.21	66.83	2.79	48.25	4.05	32.7	1.35	25.1	1.05	48.25	2.1	35.75	2.97	24.25	1.0	18.55	.75	53.65	39.2	11.8	23.5	41.35	48.25	2.1
142	74.8	3.1	54.05	4.48	36.55	1 52	28.0	1.22	67.35	2.8	48.6	4.08	32.95	1.36	25.25	1.06	48.6	2.3	36.05	2.99	24.4	1.10	18.7	.76	54.05	39.5	11.85	23.7	41.65	48.6	2.3
143	75.35	3.13	54.4	4.51	36.8	1.53	28.2	1.23	67.85	2.82	48.9	4.11	33.15	1.37	25.45	1.06	48.9	2.4	36.25	3.02	24.6	1.10	18.83	.76	54.4	39.8	11.95	23.85	41.95	48.9	2.4
144	75.9	3.15	54.75	4.54	37.05	1.54	28.4	1.24	68.35	2.84	49.3	4.13	33.4	1.38	25.65	1.07	49.3	2.6	36.5	3.04	24.75	1.20	18.95	.77	54.75	40.05	12.05	24.05	42.2	49.3	2.6

MERCHANT SHIPS ; 1st *Example* (*Continued.*)

Dimensions of Ship.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
145	76.35	3.18	55.1	4.57	37.28	1.55	28.6	1.25	68 8	2.86	49.6	4.16	33.6	1.39	25.8	1.07	49.6	2.8	36.75	3.07	24.9	1.02	19.1	.77	55.1	40.3	12.1	24.2	42.5	49.6	2.8
146	76 95	3.2	55.55	4.61	37.53	1.56	28.8	1.25	69.23	2.88	49.95	4.19	33.8	1.4	26.	1.08	49.95	2.9	37.	3.1	25.1	1.03	19.2	.78	55.55	40.6	12.2	24.35	42.8	49.9	2.9
147	77.45	3.22	55.9	4.64	37.8	1.57	29.05	1.26	69.7	2.90	50.3	4.22	34.1	1.41	26.15	1.08	50.3	2.10	37.25	3.12	25.23	1.03	19.33	.78	55.9	40.85	12.28	24.55	43.1	50.35	2.10
148	78.0	3.25	56.3	4.68	38.08	1.58	29.2	1.26	70.25	2.91	50.65	4.25	34.5	1.42	26.3	1.09	50.65	2.11	37.5	3.15	25.4	1.04	19.5	.79	56.3	41.15	12.33	24.7	43.4	50.65	2.11
149	78.5	3.28	56.7	4.71	38.35	1.59	29.4	1.27	70.7	2.93	50.98	4.28	34.6	1.43	26.5	1.09	50.98	2.12	37.75	3.18	25.58	1.04	19.65	.79	56.7	41.4	12.43	24.85	43.7	50.98	2.12
150	79.05	3.3	57.05	4.75	38.53	1.6	29.63	1.27	71.2	2.95	51.35	4.31	34.8	1.44	26.7	1.1	51.35	2.13	38.	3.2	25.75	1.05	19.75	.8	57.05	41.7	12.55	25.05	44.	51.35	2.13
151	79.6	3.32	57.48	4.78	38.85	1.61	29.8	1.28	71.7	2.97	51.7	4.34	35.	1.45	26.85	1.1	51.7	2.15	38.25	3.22	25.93	1.05	19.9	.8	57.48	42.	12.63	25.2	44.3	51.7	2.15
152	80.1	3.34	57.8	4.81	39.1	1.62	30.	1.28	72.1	2.99	52.	4.37	35.2	1.46	27.05	1.11	52.	2.17	38.5	3.24	26.1	1.06	20.05	.81	57.8	42.25	12.7	25.35	44 53	52.	2.17
153	80.6	3.36	58.2	4.84	39.35	1.63	30.15	1.29	72.6	3.01	52.35	4.39	35.45	1.47	27.2	1.11	52.35	2.18	38.75	3.26	26.25	1.06	20.15	.81	58.2	42.5	12.8	25.5	44.85	52.35	2.18
154	81.2	3.38	58.6	4.87	39.65	1.64	30.35	1.29	73.1	3.03	52.7	4.41	35.7	1.48	27.4	1.12	52·7	2.19	39.05	3.28	26.45	1.07	20.3	.82	58.6	42.78	12.85	25.65	45.1	52 7	2.19
155	81.7	3.4	59.	4.9	39.9	1.65	30.6	1.30	73.6	3.05	53.08	4.43	35.9	1.49	27.6	1 12	53.08	2.2	39.3	3.3	26.6	1.07	20.4	.82	59.	43.1	12.93	25.8	45.4	53.08	2.2
156	82.25	3.42	59.32	4.93	40.13	1.66	30.75	1.3	74.05	3.07	53.4	4.46	36.1	1.5	27.75	1.13	53.4	2.22	39.55	3.32	26.78	1.08	20.52	.83	59.32	43.35	13.05	26.	45.7	53.4	2.22
157	82 75	3.44	59.7	4.96	40.35	1.67	30.95	1.31	74.5	3.09	53.73	4.49	36.4	1.51	27.9	1.13	53.73	2.23	39.75	3.34	26.95	1.08	20.65	.83	59.7	43.6	13.1	26.15	46.	53.73	2.23
158	83.3	3.47	60.2	4.99	40.65	1.68	31.15	1.32	75.05	3.11	54.1	4.51	36.62	1.52	28.1	1.14	54.1	2.25	40.05	3.36	27.15	1.09	20.76	.84	60.2	43.9	13.2	26.3	46.25	54.1	2.25
159	83.85	3.5	60.5	5.02	40.9	1.69	31.35	1.32	75.5	3.13	54.48	4.53	36.85	1.53	28.25	1.14	54.48	2.27	40.25	3.38	27.3	1.09	20.9	.84	60.5	44.2	13.25	26.5	46.6	54.48	2.27
160	84.85	3.53	60.9	5.05	41.15	1.7	31.55	1.33	76.	3.15	54.8	4.55	37.1	1.54	28.45	1 15	54.8	2.29	40.55	3.4	27.5	1.1	21.05	.85	60.9	44.45	13.33	26.65	46.9	54.8	2.29
161	84.9	3.56	61.25	5.09	41.42	1.72	31.75	1.33	76.45	3.17	55.15	4.57	37.3	1.55	28.6	1.16	55.15	2.3	40.8	3.41	27.65	1.12	21.15	.86	61.25	44.75	13.42	26.8	47.15	55.15	2.3
162	85.45	3.58	61.65	5.12	41.7	1.73	31.95	1.34	76.95	3.19	55.5	4.6	37.55	1.56	28.8	1.17	55.5	2.32	41.05	3.42	27.85	1.13	21.3	.87	61.65	45.	13.5	27.0	47.45	55.5	2.32
163	85.98	3.6	62.05	5.15	41.95	1.75	32.15	1.34	77.4	3.21	55.85	4.63	37.8	1.57	29.	1.18	55.85	2.33	41.3	3.44	28.	1.14	21.4	.88	62.05	45.3	13.6	27.15	47.75	55.85	2.33
164	86.5	3.61	62.4	5.19	42.2	1.76	32.35	1.35	77.85	3.23	56.15	4.66	38.05	1.58	29.15	1.2	56.15	2.34	41.55	3.46	28.13	1.15	21.55	.89	62.4	45 55	13.65	27.3	48.	56.15	2.34
165	86.99	3.62	62.8	5.23	42.5	1.77	32.6	1.35	78.29	3.25	56.5	4.7	38.25	1.59	29.34	1.22	56.5	2.35	41.8	3.48	28.3	1.17	21.7	.90	62.8	45.84	13.75	27.5	48.3	56.5	2.35
166	87.55	3.66	63.25	5.27	42.73	1.79	32.8	1.36	78.8	3.29	56.85	4.72	38.5	1.60	29.55	1.23	56.85	2.37	42.05	3.52	28.45	1.18	21.8	.91	63.25	46.1	13.83	27.65	48.6	56.85	2.37
167	88.08	3.68	63.53	5.31	42.98	1.80	33.	1.38	79.28	3.29	57.15	4.74	38.72	1.61	29 7	1.25	57.15	2.39	42.3	3.56	28.65	1.18	21.93	.92	63.55	46.38	13.9	27.8	48.9	57.15	2.39
168	88.65	3.7	63.93	5.35	43.25	1.82	33.18	1.4	79.78	3.31	57.55	4.76	38.95	1.63	29.9	1.26	57.55	2.41	42.55	3.59	28.85	1.19	22.08	.93	63.93	46.65	14.0	28.	49.2	57.55	2.41
169	89.1	3.72	64.3	5.38	43.48	1.83	33.33	1.41	80.2	3.32	57.83	4.78	39.15	1.64	30.05	1.27	57.83	2.43	42.8	3.61	29.05	1.19	22.22	.94	64.3	46.9	14.05	28.15	49.5	57.83	2.43
170	89.65	3 76	64.67	5.4	43.78	1.85	33.52	1.43	80.7	3.34	58.2	4.8	39.4	1.65	30.22	1.28	58.2	2.45	43.05	3.64	29.2	1.2	22.35	.95	64.67	47.2	14.15	28.3	49.8	58.2	2.45

MERCHANT SHIPS; 1st *Example.*

Dimensions of Ship.	LOWER-MASTS.									TOP-MASTS.						TOP-GALLANT MASTS.						ROYAL-MASTS.						Bowsprit.	Jib-boom.	Flying jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore		Mizen.				
Breadth.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed to Qr.-deck.	Hounded.	Headed.	Hou nded.	Headed.	Hounded.	Headed	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed	Hounded.	Headed.	Hounded.	Headed.			
30.	60.6	12.1	14.65	54.58	10.88	13.9	50.65	8.18	9.63	38.65	6.25	34.9	5.6	25.55	3.58	19.1	2.75	17.15	2.45	12.4	1.78	12.73	2.11	11.8	2.0	8.5	1.35	43.78	30.95	31.6
30.5	61.6	12.3	14.9	55.45	11.05	14.1	51.5	8.3	9.78	39.25	6.35	35.45	5.7	26.0	3.63	19 4	2.8	17.43	2.48	12.6	1.81	12.95	2.15	12.	2.03	8.65	1.38	44.46	31.45	32.1
31.	62.65	12.5	15.1	56.42	11.24	14.4	52.40	8.43	9.95	39.95	6.48	36.08	5 8	26.4	3.7	19.75	2.83	17.75	2.51	12.8	1.84	13.15	2.19	12.2	2.06	8.78	1.4	45.2	32.05	32.65
31.5	63.68	12.7	15.35	57.4	11.4	14.6	53.25	8.58	10.1	40.6	6.58	36.65	5.9	26.82	3.76	20.05	2.87	18.05	2.55	13.05	1.87	13.35	2.22	12.4	2.09	8.9	1.43	45.95	32 52	33.2
32.	64.7	12.9	15.65	58.35	11.63	14.88	54.15	8.72	10.3	41.28	6.7	37.25	6.	27.3	3.82	20.45	2.92	18.35	2.59	13.25	1.9	13.63	2.26	12.6	2.1	9.05	1.45	46.7	33.1	33.75
32.5	65.8	13.1	15.85	59.25	11.79	15 1	55.05	8.87	10.45	41.95	6.8	37.82	6.1	27.7	3.89	20.75	2.98	18.65	2.65	13.45	1.94	13.8	2.3	12.8	2.13	9.2	1.47	47.45	33.6	34.25
33.	66.85	13.3	16.15	60.25	12.05	15.35	55.9	9.05	10.65	42.65	6.91	38.45	6.2	28.15	3.94	21.1	3.05	18.95	2.7	13.65	1.98	14.05	2.33	13.	2.17	9.35	1.5	48.2	34.15	34.85
33.5	67.85	13.5	16.35	61.1	12.15	15.55	56.7	9.15	10.75	43.2	7 02	39.	6.3	28.5	4.05	21.35	3.09	19.2	2.75	13.85	2.0	14.25	2.36	13.2	2.21	9.5	1.53	48.9	34.6	35.3
34.	68.85	13.7	16.65	62.	12.33	15.8	57.58	9.3	10.95	43.9	7.1	39.6	6.4	29.	4 1	21.75	3.13	19.53	2.8	14.1	2.02	14.5	2.4	13.4	2.25	9.65	1.55	49.65	35.2	35.9
34.5	69.85	13.9	16.85	62.9	12.52	16.05	58.37	9.43	11.1	44.5	7.2	40.2	6.5	29.4	4.13	22.05	3.15	19.8	2.85	14.3	2.05	14.7	2.45	13.6	2.28	9.8	1.58	50.35	35.65	36.35
35.	70.85	14.1	17.1	63.8	12.7	16.28	59.25	9.55	11.3	45.15	7.31	40.75	6.6	29.85	4.21	22.35	3.18	20.1	2.9	14.5	2.08	14 93	2.5	13.8	2.3	9.95	1.6	51.1	36.2	36.95
35.5	71.80	14.3	17.33	64.7	12.88	16.5	60.05	9.68	11.45	45.75	7.42	41.3	6.68	30.25	4.26	22.65	3.23	20.35	2.95	14.7	2.1	15.1	2.53	14.	2.33	10.05	1.63	51.8	36.68	37.4
36.	72.85	14.53	17.6	65.6	13.1	16.73	60.9	9.85	11.6	46.4	7.54	41.9	6.75	30.7	4.33	23.	3.29	20.65	3.	14.9	2.13	15.33	2.58	14.2	2.36	10.25	1.66	52.58	37.23	38.
36.5	73.9	14.73	17.8	66.5	13.25	16.95	61.75	9.95	11.75	47.05	7.65	42.5	6.83	31.1	4.4	23.3	3.35	20.93	3.05	15.1	2.16	15.53	2.61	14.4	2.39	10.35	1.69	53.28	37.7	38.45
37.	74.83	14.93	18.05	67.4	13.42	17.2	62.55	10.1	11.9	47.65	7.74	43.08	6.93	31.5	4.46	23.6	3.4	21.25	3.08	15.3	2.19	15.75	2.65	14.6	2.42	10.5	1.72	54.05	38.22	39.05
37.5	75.90	15.1	18.3	68.33	13.6	17.4	63.45	10.2	12.05	48.3	7.85	43.7	7.05	32.	4.52	23.9	3.45	21.5	3.11	15.5	2.22	15.95	2.68	14.78	2.46	10.6	1.75	54.75	38.75	39.55
38.	76.85	15.32	18.58	69.2	13.8	17.65	64.25	10.38	12.2	48.95	7.95	44.25	7.13	32.35	4.58	24.25	3.5	21.8	3.15	15.7	2.25	16.2	2.7	14.95	2.5	10.8	1.78	55.43	39.28	40.05
38.5	77.90	15.55	18.8	70.1	14.	17.88	65.15	10.5	12.38	49.58	8.05	44.8	7.23	32.8	4.62	24.55	3.53	22.05	3.19	15.9	2.28	16.4	2.73	15.15	2.54	10.95	1.81	56.15	39.8	40.6
39.	78.90	15.75	19.05	71.1	14.13	18.1	66.	10.65	12.53	50.25	8.13	45.4	7.3	33.28	4.7	24.85	3.58	22.33	3.23	16.15	2.31	16.6	2.76	15.35	2.58	11.05	1.84	56.93	40.3	41.1
39.5	79.95	15.95	19.3	72.05	14.3	18.34	66.8	10.75	12.7	50.9	8.23	45.98	7.4	33.7	4.75	25.15	3.6	22.65	3.27	16.35	2.33	16.8	2.8	15.55	2.62	11.2	1.87	57.65	40.8	41.6
40.	80.9	16.15	19.55	72.82	14.5	18.6	67.6	10.9	12.85	51.55	8.35	46.53	7.5	34.1	4.8	25.5	3.65	22.95	3.3	16.6	2.35	17.05	2.83	15.75	2.65	11.35	1.9	58.35	41.3	42.2
40 5	82.08	16.35	19.8	73.83	14.7	18.8	68.55	11.05	13.	52.2	8.45	47.15	7.6	34.5	4.88	25.8	3.7	23.24	3.35	16.8	2.38	17.23	2.87	15.95	2.68	11.5	1.92	59.1	41.85	42.7
41.	83.0	16.6	20.	74.6	14.87	19.05	69.31	11.15	13.15	52.8	8.55	47.63	7.7	35.	4.95	26.1	3 75	23.5	3.39	17.0	2.41	17.4	2.9	16.15	2.7	11.63	1.94	59.75	42.35	43.2
41.5	84.0	16 75	20.25	75.55	15.05	19.25	70.15	11.3	13.33	53.45	8.65	48.26	7.78	35.35	5.05	26.45	3.8	23.78	3.42	17.15	2.45	17.65	2.95	16.35	2.73	11.75	1.96	60.5	42.9	43.73
42.	84.84	16.96	20.5	76.35	15.27	19.5	71.0	11.45	13.5	54.18	8.74	48.76	7.86	35.76	5 1	26.77	3.83	24.09	3.46	17.39	2.48	17.85	2.99	16.52	2.75	11.92	1.98	61.08	43.33	44.23
42.5	85.90	17.15	20.75	77.4	15.41	19.75	71.85	11.6	13.65	54.78	8.85	49.4	7.95	36.22	5.13	27.1	3.88	24.38	3.5	17.6	2.5	17.99	3.03	16.75	2.79	12.08	2.0	62.	43.9	44.8
43.	87.0	17.35	21.	78.3	15.6	20.	72.7	11.75	13.8	55.4	8.95	49.98	8.1	36.65	5.19	27.42	3.91	24.7	3.55	17.8	2.52	18.29	3.07	16.95	2.83	12.2	2 02	62.7	44.5	45.3
43.5	88.0	17.55	21.25	79.2	15.75	20.2	73.45	11.88	14.	56.05	9.08	50.6	8.2	37.05	5.23	27.71	3.96	24.95	3.6	18.05	2.55	18.5	3.09	17.15	2.87	12.35	2.04	63.35	44.95	45.8
44.	89.0	17.75	21.5	80.08	15.95	20 4	74.55	12.05	14.15	56.65	9.18	51.1	8.28	37.45	5.29	28.05	4.	25.2	3.64	18.2	2.58	18.7	3.11	17.3	2.9	12.45	2.06	64.1	45.4	46.3
44.5	90.05	17.95	21.75	81.	16.1	20.64	75.25	12.05	14.3	57.3	9.28	51.76	8.35	37.9	5.32	28.35	4.05	25.5	3.68	18.4	2.62	18.9	3.14	17.5	2.94	12.6	2.08	64.88	46.	46.85
45.	91.05	18.1	22.	82.	16.3	20 9	76.1	12.35	14.45	57.98	9.4	52.35	8.45	38.3	5.4	28.65	4.1	25.8	3.72	18.6	2.66	19.1	3.18	17.7	2.99	12.73	2.1	65.6	46.45	47.4
45.5	92.05	18.3	22.25	82.85	16.5	21.1	77.	12.4	14.6	58.55	9.5	52.9	8.55	38.75	5.45	29.	4.15	26.05	3.76	18.82	2 7	19.3	3.21	17.9	3.04	12.86	2.13	66.3	47.	48.
46.	93.05	18.5	22.5	83.70	16.7	21.33	77.75	12.56	14.75	59.2	9.6	53.45	8.65	39.2	5.55	29.3	4.2	26.4	3.8	19.05	2.75	19.55	3.25	18.1	3.08	13.05	2.15	67 05	47.48	48.4

MERCHANT SHIPS; *2nd Example.*

Dimensions of Ship.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
100	51.9	2.17	35.85	3.	22.63	.95	16.05	0.65	46.7	1.98	32.3	2.7	20.4	.88	14.5	0.55	32.3	1.4	22.3	1.9	14.35	0.6	10.35	0.47	35.85	27.2	8.96	17.9	31.2	32.3	1.4
101	52.4	2.2	36.2	3.03	22.85	.96	16.22	0.65	47.2	1.99	32.55	2.72	20.6	.89	14.65	0.55	32.55	1.41	22.55	1.92	14.5	0.6	10.45	0.47	36.2	27.5	9.05	18.05	31.5	32.55	1.41
102	52.9	2.22	36.55	3.06	23.05	.97	16.35	0.66	47.6	2.02	32.9	2.74	20.8	.89	14.8	0.56	32.9	1.42	22.74	1.94	14.6	0.61	10.55	0.47	36.55	27.75	9.12	18.23	31.8	32.9	1.42
103	53.45	2.26	36.9	3.09	23.3	.98	16.52	0.66	48.1	2.04	33.25	2.76	21.	.9	14.95	0.56	33.25	1.43	22.95	1.96	14.75	0.62	10.65	0.47	36.9	28.05	9.2	18.4	32.1	33.25	1.43
104	53.95	2.28	37.3	3.12	23.55	.99	16.7	0.67	48.6	2.06	33.55	2.79	21.2	.9	15.1	0.57	33.55	1.44	23.18	1.98	14.95	0.62	10.75	0.47	37.3	28.3	9.3	18.6	32.4	33.55	1.44
105	54.45	2.3	37.65	3.15	23.75	1.	16.85	0.67	49.05	2.08	33.9	2.82	21.4	.91	15.28	0.57	33.9	1.45	23.42	2.	15.05	0.62	10.85	0.48	37.65	28.6	9.4	18.8	32.73	33.9	1.45
106	55.	2.32	38.	3.18	24.05	1.01	17.05	0.68	49.5	2.1	34.2	2.85	21.6	.92	15.43	0.58	34.2	1.46	23.68	2.02	15.23	0.63	10.95	0.48	38.	28.89	9.5	18.98	33.	34.2	1.46
107	55.55	2.34	38.35	3.21	24.25	1.02	17.2	0.68	50.	2.12	34.5	2.88	21.8	.93	15.6	0.58	34.5	1.47	23.9	2.04	15.35	0.63	11.1	0.48	38.35	29.15	9.6	19.1	33.35	34.5	1.47
108	56.05	2.36	38.7	3.24	24.45	1.03	17.35	0.69	50.45	2.14	34.85	2.91	22.	.94	15.7	0.59	34.85	1.48	24.1	2.06	15.5	0.64	11.2	0.48	38.7	29.4	9.7	19.3	33.65	34.85	1.48
109	56.6	2.38	39.08	3.27	24.68	1.04	17.55	0.69	50.95	2.16	35.2	2.94	22.2	.95	15.85	0.59	35.2	1.49	24.3	2.08	15.65	0.64	11.3	0.48	39.08	29.7	9.8	19.5	34.	35.2	1.49
110	57.1	2.4	39.4	3.3	24.93	1.05	17.7	0.7	51.35	2.18	35.5	2.97	22.4	.96	16.	0.6	35.5	1.5	24.55	2.1	15.75	0.65	11.4	0.49	39.4	30.05	9.88	19.7	34.3	35.5	1.5
111	57.65	2.42	39.8	3.33	25.1	1.06	17.85	0.7	51.85	2.2	35.8	3.	22.6	.97	16.15	0.61	35.8	1.51	24.78	2.12	15.93	0.65	11.5	0.49	39.8	30.3	9.96	19.9	34.6	35.8	1.51
112	58.1	2.44	40.12	3.36	25.35	1.07	18.05	0.71	52.3	2.21	36.1	3.02	22.85	.98	16.3	0.61	36.1	1.52	24.98	2.14	16.08	0.66	11.6	0.49	40.12	30.55	10.05	20.05	34.9	36.1	1.52
113	58.6	2.46	40.5	3.39	25.6	1.08	18.2	0.71	52.76	2.23	36.4	3.04	23.05	.99	16.45	0.61	36.4	1.53	25.2	2.16	16.2	0.66	11.7	0.5	40.5	30.8	10.12	20.15	35.2	36.4	1.53
114	59.15	2.49	40.85	3.42	25.8	1.09	18.3	0.72	53.25	2.25	36.8	3.07	23.25	1.	16.6	0.62	36.8	1.54	25.4	2.18	16.35	0.67	11.8	0.5	40.85	31.05	10.23	20.4	35.5	36.8	1.54
115	59.65	2.50	41.2	3.45	26.05	1.1	18.45	0.72	53.55	2.27	37.1	3.1	23.45	1.01	16.75	0.62	37.1	1.55	25.65	2.20	16.45	0.67	11.9	0.5	41.2	31.3	10.3	20.6	35.8	37.1	1.55
116	60.25	2.52	41.6	3.48	26.25	1.12	18.65	0.73	54.15	2.29	37.4	3.13	23.65	1.01	16.9	0.63	37.4	1.57	25.88	2.21	16.65	0.68	12.	0.51	41.6	31.6	10.4	20.75	36.15	37.4	1.57
117	60.7	2.54	42.	3.51	26.5	1.13	18.8	0.73	54.6	2.31	37.75	3.16	23.85	1.02	17.05	0.63	37.75	1.59	26.1	2.22	16.78	0.68	12.1	0.51	42.	31.85	10.5	20.95	36.45	37.75	1.59
118	61.25	2.56	42.3	3.54	26.75	1.14	19.	0.74	55.1	2.33	38.1	3.19	24.1	1.02	17.2	0.64	38.1	1.63	26.3	2.24	16.93	0.69	12.2	0.51	42.3	32.1	10.6	21.1	36.75	38.1	1.63
119	61.7	2.58	42.68	3.57	27.	1.15	19.15	0.74	55.55	2.35	38.4	3.22	24.3	1.03	17.3	0.64	38.4	1.66	26.55	2.26	17.06	0.69	12.3	0.51	42.68	32.4	10.7	21.3	37.05	38.4	1.66
120	62.25	2.6	43.05	3.6	27.2	1.16	19.3	0.75	56.05	2.37	38.75	3.25	24.45	1.04	17.43	0.65	38.75	1.68	26.75	2.28	17.2	0.7	12.4	0.52	43.05	32.65	10.78	21.5	37.4	38.75	1.68
121	62.75	2.62	43.35	3.63	27.4	1.17	19.45	0.75	56.5	2.38	39.05	3.27	24.65	1.04	17.6	0.65	39.05	1.7	26.95	2.29	17.35	0.7	12.5	0.52	43.35	32.95	10.85	21.65	37.7	39.05	1.7
122	63.25	2.64	43.75	3.65	27.6	1.18	19.6	0.76	57.	2.39	39.35	3.3	24.85	1.05	17.73	0.66	39.35	1.71	27.15	2.3	17.4	0.7	12.6	0.52	43.75	33.2	10.95	21.8	38.	39.35	1.71
123	63.8	2.66	44.1	3.67	27.8	1.19	19.78	0.76	57.45	2.4	39.7	3.32	25.08	1.05	17.9	0.66	39.7	1.71	27.43	2.31	17.63	0.71	12.7	0.52	44.1	33.5	11.05	22.	38.3	39.7	1.71
124	64.3	2.68	44.44	3.7	28.05	1.19	19.92	0.77	57.85	2.42	40.	3.34	25.26	1.06	18.05	0.67	40.	1.72	27.6	2.32	17.75	0.71	12.8	0.53	44.44	33.75	11.1	22.15	38.6	40.	1.72

MERCHANT SHIPS; *2nd Example.—(Continued.)*

Dimensions of Ship.	Main-yards.								Fore-yards								Mizen-yards.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
125	64.85	2.70	44.8	3.73	28 3	1.2	20.1	0.77	58.35	2.44	40.3	3.36	25.48	1.06	18.15	0.68	40.3	1.72	27.85	2.33	17.93	0.71	12.9	0.53	44.8	34.05	11.2	22.3	38.9	40.3	1.72
126	65.4	2.72	45.2	3.76	28.5	1.21	20.2	0.78	58.8	2.46	40.65	3.38	25.66	1.07	18.28	0.68	40.65	1.73	28.05	2.34	18.08	0.72	13.	0.53	45.2	34.3	11.28	22.5	39.25	40.65	1.73
127	65.9	2.74	45.52	3.79	28.73	1.21	20.4	0.78	59.3	2.48	41.05	3.40	25.88	1.07	18.47	0.68	41.05	1.73	28.3	2.35	18.2	0.72	13.1	0.54	45.52	34.6	11.35	22.65	39.6	41.	1.74
128	66.4	2.76	45.88	3.82	28.95	1.22	20.55	0.79	59.7	2.49	41.3	3.43	26.1	1.08	18.55	0.69	41.3	1.74	28.5	2.37	18.33	0.72	13.2	0.54	45.88	34.85	11.45	22.85	39.9	41.3	1.75
129	66.95	2.78	46.25	3.85	29 2	1.23	20.73	0.79	60.3	2.50	41.6	3.46	26.3	1.08	18.78	0.69	41.6	1.74	28.73	2.39	18.49	0.72	13.3	0.54	46.25	35.15	11.53	23.05	40.2	41.6	1.76
130	67.5	2.81	46.6	3.88	29.5	1.24	20.	0.8	60.7	2.52	41.99	3.49	26.55	1.09	18.9	0.7	41.99	1.75	28.98	2.41	18.6	0.73	13.4	0.55	46.6	35.4	11.64	23.25	40.5	41.99	1.77
131	67.95	2.83	47.	3.91	29.68	1.25	21.15	0.81	61.1	2.54	42.3	3.51	26.7	1.1	19.05	0.7	42.3	1.77	29.2	2.42	18.78	0.73	13.5	0.55	47.	35.67	11.7	23.4	40.8	42.3	1.78
132	68.5	2.85	47.3	3.94	29.9	1.26	21.3	0.82	61.6	2.56	42.6	3.53	26.9	1.11	19.2	0.71	42.6	1.79	29 4	2.43	18.9	0.74	13.6	0.55	47.3	36.	11.8	23.55	40.1	42.6	1.79
133	68.98	2.87	47.66	3.97	30.2	1.27	21.45	0.83	62.1	2.58	43.	3.56	27.1	1.12	19.3	0.71	43.	1.81	29.6	2.44	19.05	0.74	13.7	0.56	47.66	36.23	11.9	23.75	40.43	43.	1.81
134	69.5	2.9	48.	4.	30.35	1.28	21.6	0.84	62.55	2 6	43.25	3.59	27.3	1.13	19.45	0.72	43.25	1.83	29.8	2.45	19.22	0.75	13.8	0.56	48.	36.48	12.	23.93	41.73	43.25	1.83
135	70.	2.93	48.38	4.03	30.6	1.29	21.75	0.85	63.	2.63	43.55	3.62	27.5	1.14	19.6	0.72	43.55	1.85	30.1	2.46	19.35	0.75	13.9	0.57	48.38	36.75	12.1	24.1	42.05	43.55	1.85
136	70.53	2.95	48.75	4.06	30.85	1.3	21.9	0.86	63.45	2.66	43.85	3.65	27.7	1.15	19.75	0.73	43.85	1.87	30.3	2.47	19.5	0.76	14.	0.57	48.75	37.05	12.18	24.25	42.3	43.85	1.87
137	71.05	2.97	49.1	4.09	31.1	1.31	22.	0.87	63 95	2.69	44.2	3.67	27.9	1.16	19.9	0.73	44.2	1.89	30.55	2.49	19.65	0.77	14.1	0.58	49.1	37.3	12 25	24.45	42.7	44.2	1.89
138	71 6	3.	49.5	4.12	31.25	1.32	22.15	0.88	64.4	2.71	44.5	3.7	28.1	1.17	20.05	0.74	44.5	1.91	30.75	2.51	19.78	0.78	14.2	0.58	49.5	37.55	12.34	24.69	43.	44.5	1.91
139	72.1	3.02	49.85	4.15	31.45	1.33	22.3	0.89	64.9	2.73	44.8	3.72	28.3	1.19	20.2	0.74	44.8	1.93	30.95	2 53	19.92	0.79	14.3	0.59	49.85	37.85	12.43	24.85	43.3	44.8	1.93
140	72.6	3.04	50.2	4 18	31.7	1.35	22.5	0.9	65.35	2.75	45.1	3.75	28.55	1.2	20.35	0.75	45.1	1.95	31.2	2.55	20.1	0.8	14.4	0.59	50.2	38.1	12.55	25.	43.6	45.1	1.95
141	73.1	3.06	50.53	4.21	31.9	1.36	22 65	0.9	65.8	2.76	45.45	3.78	28.7	1.21	20.5	0.75	45.45	1.96	31.4	2.57	20.2	0.8	14.53	0.59	50.53	38.35	12.63	25.15	43 9	45.45	1.96
142	73.6	3.09	50.9	4.24	32.15	1.37	22.8	0.91	66.25	2.78	45.8	3.8	28.9	1.22	20.65	0.76	45.8	1.97	31.6	2.59	20.3	0.81	14.65	0.6	50.9	38.65	12.7	25.33	44.2	45.8	1.97
143	74.15	3.12	51.25	4.27	32.35	1.38	23.	0.91	66.7	2.8	46.1	3.82	29.15	1.22	20.8	0.76	46.1	1.98	31.85	2.61	20.5	0.81	14.77	0.6	51.25	39.9	12.8	25.52	44.5	46.1	1.98
144	74.7	3.15	51.6	4.3	32.6	1.39	23.13	0.92	67.2	2.82	46.45	3.84	29.35	1.23	20.95	0.77	46.45	1.99	32.05	2.63	20.65	0.82	14.88	0.6	51.6	39.2	12.9	25.7	44.8	46.45	1.99
145	75.2	3.17	51.95	4.33	32.8	1.40	23.3	0.92	67.65	2.84	46.78	3.87	29.55	1.23	21.05	0.77	46.78	2.	32.3	2.65	20.8	0.82	15	0.61	51.95	39.45	13.	25.9	45.1	46.78	2.
146	75.75	3.2	52.35	4.36	33.05	1.41	23 5	0.93	68.15	2.86	47.1	3.9	29.8	1.24	21.24	0.78	47.1	2.01	32.5	2.68	20.93	0.83	15.1	0.61	52.35	39.75	13.1	26.1	45.45	47 1	2.01
147	76.25	3.22	52.68	4.4	33.3	1.42	23.65	0 93	68.6	2.88	47.4	3.93	30.05	1.25	21.4	0.78	47.4	2.02	32.75	2.71	21.1	0.83	15.2	0.61	52.68	40.	13.18	26.25	45.75	47.4	2.02
148	76 78	3.24	53.	4.43	33.5	1.43	23.8	0.94	69.05	2.90	47.76	3.95	30.25	1.26	21.5	0.79	47.76	2.03	32.95	2.74	21.2	0.84	15.3	0.62	53.	40.26	13.26	26 4	46.1	47.76	2.03
149	77.3	3.26	53.43	4.45	33.7	1.44	23 95	0.94	69.55	2.91	48.08	3.98	30.4	1.27	21.65	0.79	48.08	2.04	33.2	2.77	21.33	0.84	15.4	0.62	53.43	40.55	13.33	26.6	46.4	48.08	2.04
150	77.8	3.28	53.75	4.48	33.95	1.45	24.1	0.95	70.	2.93	48.38	4.	30.6	1.28	21.8	0.8	48.38	2.05	33.4	2.8	21.45	0.85	15.5	0.62	53.75	40.8	13.4	26.8	46.7	48.38	2.05

MERCHANT SHIPS; *2nd Example.*

Dimensions of Ship.	Lower-masts.									Top-masts.						Top-gallant-masts.						Royal-masts.			Bowsprit.	Jib-boom.	Flying-jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.	Fore.	Mizen.			
Breadth.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Pole.	Pole.	Pole.			
26.5	51.85	10.35	16.75	16.70	9.4	15.7	43.6	7.05	15.35	32.15	5.2	28.9	4.7	20.3	2.9	16.35	2.35	14.7	2.1	10.1	1.57	10.35	9.3	6.4	35.2	25.1	27.15
27.	52.9	10.6	17.05	47.55	9.6	16.	44.2	7.15	15.6	32.75	5.3	29.4	4.8	20.65	2.95	16.65	2.4	14.95	2.15	10.25	1.6	10.6	9.5	6.52	35.88	25.55	27.65
27.5	53.8	10.77	17.38	48.5	9.75	16.3	45.1	7.3	15.95	33.4	5.4	30.1	4.9	21.05	3.	17.	2.45	15.25	2.2	10.45	1.62	10.77	9.68	6.65	36.6	26.1	28.2
28.	54.75	10.95	17.65	49.3	9.93	16.6	45.85	7.4	16.2	33.95	5.5	30.55	5.	21.4	3.05	17.2	2.5	15.5	2.24	10.62	1.64	10.95	9.8	6.78	37.2	26.5	28.65
28.5	55.6	11.15	18.	50.2	10.1	16.9	46.65	7.55	16.45	34.55	5.6	31.05	5.08	21.8	3.1	17.55	2.55	15.75	2.28	10.78	1.66	11.15	9.95	6.9	37.85	27.	29.2
29.	56.6	11.3	18.3	51.	10.25	17.15	47.35	7.68	16.75	35.1	5.7	31.55	5.1	22.1	3.15	17.8	2.58	16.05	2.31	11.	1.69	11.3	10.15	7.05	38.45	27.4	29.65
29.5	57.5	11.5	18.6	51.9	10.45	17.65	48.2	7.8	17.05	35.7	5.8	32.1	5.2	22.5	3.2	18.1	2.6	16.33	2.34	11.2	1.72	11.5	10.32	7.13	39.05	27.85	30.15
30.	58.6	11.7	18.9	52.7	10.6	17.7	49.	7.95	17.3	36.28	5.9	32.65	5.28	22.85	3.28	18.43	2.63	16.6	2.37	11.35	1.75	11.7	10.55	7.25	39.75	28.3	30.7
30.5	59.5	11.9	19.25	53.68	10.75	18.05	49.9	8.05	17.65	36.95	6.	33.25	5.35	23.3	3.32	18.78	2.68	16.87	2.4	11.55	1.77	11.9	10.7	7.4	40.5	28.85	30.23
31.	60.5	12.1	19.55	54.5	10.95	18.3	50.65	8.2	17.9	37.5	6.1	33.75	5.45	23.65	3.38	19.1	2.72	17.15	2.45	11.75	1.8	12.1	10.88	7.5	41.1	29.35	31.7
31.5	61.5	12.3	19.85	55.38	11.1	18.6	51.5	8.3	18.2	38.15	6.18	34.3	5.55	24.05	3.43	19.35	2.76	17.4	2.5	11.9	1.82	12.3	11.1	7.63	41.75	29.75	32.25
32.	62.4	12.5	20.2	56.25	11.25	18.9	52.31	8.44	18.5	38.75	6.25	34.87	5.63	24.42	3.48	19.69	2.81	17.72	2.53	12.1	1.85	12.5	11.3	7.75	42.4	30.28	32.8
32.5	63.4	12.7	20.5	57.1	11.45	19.25	53.1	8.6	18.78	39.3	6.35	35.4	5.73	24.8	3.56	20.05	2.86	17.95	2.56	12.3	1.87	12.7	11.4	7.85	43.05	30.75	33.25
33.	64.3	12.9	20.8	58.	11.65	19.5	53.9	8.7	19.05	39.9	6.45	35.9	5.8	25.15	3.6	20.25	2.9	18.25	2.6	12.5	1.9	12.9	11.55	8.	43.75	31.2	33.75
33.5	65.3	13.1	21.08	58.85	11.82	19.8	54.7	8.84	19.3	40.55	6.55	36.45	5.9	25.55	3.68	20.58	2.93	18.5	2.65	12.65	1.93	13.1	11.7	8.1	44.4	31.65	34.25
34.	66.45	13.3	21.45	59.75	12.05	20.1	55.35	8.98	19.65	41.1	6.65	37.05	6.	25.9	3.72	20.9	2.98	18.78	2.7	12.85	1.96	13.3	11.9	8.23	45.05	32.1	34.75
34.5	67.45	13.5	21.8	60.75	12.2	20.45	56.45	9.1	19.95	41.8	6.75	37.6	6.1	26.4	3.78	21.28	3.04	19.1	2.75	13.1	2.	13.5	12.1	8.35	45.8	32.7	35.25
35.	68.35	13.7	22.1	61.65	12.4	20.75	57.3	9.25	20.25	42.45	6.85	38.15	6.2	26.78	3.83	21.6	3.08	19.4	2.78	13.3	2.05	13.7	12.3	8.5	46.48	33.15	35.85
35.5	69.35	13.85	22.4	62.45	12.55	21.05	58.08	9.35	20.53	43.	6.95	38.65	6.3	27.1	3.9	21.86	3.11	19.65	2.83	13.45	2.08	13.85	12.45	8.6	47.1	33.6	36.35
36.	70.35	14.05	22.75	63.35	12.75	21.3	59.	9.5	20.8	43.6	7.05	39.25	6.38	27.5	3.95	22.15	3.15	19.95	2.86	13.65	2.11	14.05	12.65	8.7	47.8	34.05	36.85
36.5	71.35	14.25	23.05	64.25	12.9	21.65	59.7	9.65	21.1	44.2	7.15	39.8	6.45	27.9	4.05	22.5	3.2	20.2	2.9	13.85	2.14	14.25	12.8	8.85	48.4	34.55	37.35
37.	72.35	14.45	23.4	65.15	13.1	21.95	60.6	9.75	21.4	44.85	7.25	40.3	6.55	28.25	4.1	22.8	3.25	20.5	2.95	14.05	2.17	14.45	13.0	8.95	49.1	35.05	37.9
37.5	73.35	14.65	23.7	66.05	13.28	22.2	61.4	9.9	21.7	45.45	7.35	40.9	6.63	28.7	4.13	23.1	3.3	20.8	3.	14.25	2.2	14.65	13.18	9.1	49.85	35.5	38.45
38.	74.3	14.85	24.05	67.	13.42	22.5	62.2	10.05	22.	46.05	7.45	41.4	6.7	29.05	4.18	23.4	3.35	21.05	3.04	14.4	2.23	14.85	13.35	9.2	50.45	35.98	38.95
38.5	75.3	15.05	24.35	67.85	13.62	22.8	63.	10.2	22.3	46.7	7.55	41.95	6.8	29.45	4.22	23.75	3.4	21.35	3.08	14.65	2.26	15.05	13.5	9.3	51.2	36.45	39.45
39.	76.28	15.2	24.65	68.75	13.8	23.1	63.9	10.3	22.6	47.3	7.65	42.5	6.88	29.8	4.3	24.05	3.43	21.65	3.12	14.8	2.29	15.2	13.7	9.44	51.8	36.95	39.95
39.5	77.18	15.4	24.95	69.55	13.98	23.4	64.65	10.43	22.85	47.9	7.75	43.1	6.95	30.2	4.33	24.3	3.48	21.9	3.15	15.	2.32	15.4	13.9	9.58	52.45	37.4	40.5
40.	78.20	15.6	25.25	70.4	14.1	23.65	65.45	10.53	23.15	48.45	7.85	43.6	7.05	30.55	4.4	24.6	3.52	22.15	3.18	15.2	2.35	15.6	14.1	9.67	53.1	37.9	40.95

MERCHANT SHIPS, *3rd Example.*

Length.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.														
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top sail.	Arm.	Top gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
90	46.2	1.9	32.6	2.7	21.8	.8	16.7	.6	44.0	1.8	30.5	2.5	20.0	.8	15.0	.6	30.5	1.2	20.3	1.6	12.4	.5	8.4	.3	33.2	20.7	6.2	12.4	25.6	30.5	1.2
91	46.7	1.9	32.9	2.7	22.1	.9	16.9	.6	44.5	1.8	30.8	2.5	20.3	.8	15.1	.6	30.8	1.2	20.5	1.6	12.6	.5	8.5	.3	33.5	20.9	6.3	12.6	25.9	30.8	1.2
92	47.2	1.9	33.3	2.7	22.3	.9	17.1	.6	45.0	1.8	31.2	2.6	20.5	.8	15.2	.6	31.2	1.3	20.7	1.7	12.7	.5	8.6	.3	33.9	21.1	6.3	12.7	26.2	31.2	1.3
93	47.7	1.9	33.6	2.7	22.5	.9	17.3	.7	45.4	1.8	31.5	2.6	20.7	.8	15.4	.6	31.5	1.3	21.0	1.7	12.8	.5	8.7	.3	34.3	21.3	6.4	12.8	26.4	31.5	1.3
94	48.2	1.9	34.0	2.8	22.8	.9	17.5	.7	45.9	1.8	31.8	2.6	20.9	.8	15.6	.6	31.8	1.3	21.2	1.7	13.0	.5	8.8	.3	34.6	21.6	6.5	13.0	26.7	31.8	1.3
95	48.7	2.0	34.4	2.8	23.0	.9	17.6	.7	46.4	1.9	32.2	2.6	21.1	.8	15.8	.6	32.2	1.3	21.4	1.7	13.1	.5	8.9	.3	35.0	21.8	6.5	13.1	27.0	32.2	1.3
96	49.2	2.0	34.7	2.8	23.3	.9	17.8	.7	46.9	1.9	32.5	2.7	21.4	.8	15.9	.6	32.5	1.3	21.6	1.7	13.2	.5	9.0	.3	35.3	22.0	6.6	13.2	27.3	32.5	1.3
97	49.8	2.0	35.1	2.9	23.5	.9	18.0	.7	47.4	1.9	32.9	2.7	21.6	.8	16.1	.6	32.9	1.3	21.9	1.8	13.4	.5	9.1	.3	35.8	22.2	6.7	13.4	27.6	32.9	1.3
98	50.3	2.0	35.5	2.9	23.8	.9	18.2	.7	47.9	1.9	33.2	2.7	21.8	.8	16.3	.6	33.2	1.3	22.1	1.8	13.5	.5	9.2	.3	36.1	22.5	6.7	13.5	27.9	33.2	1.3
99	50.8	2.0	35.8	2.9	24.0	.9	18.4	.7	48.4	1.9	33.5	2.7	22.0	.9	16.4	.6	33.5	1.3	22.3	1.8	13.7	.5	9.3	.3	36.5	22.7	6.8	13.7	28.2	33.5	1.3
100	51.3	2.1	36.2	3.0	24.3	.9	18.6	.7	48.9	2.0	33.9	2.8	22.3	.9	16.6	.6	33.9	1.4	22.6	1.8	13.8	.5	9.4	.3	36.9	23.0	6.9	13.8	28.4	33.9	1.4
101	51.9	2.1	36.6	3.0	24.5	1.0	18.8	.7	49.4	2.0	34.2	2.8	22.5	.9	16.8	.6	34.2	1.4	22.8	1.8	13.9	.5	9.5	.3	37.2	23.2	6.9	13.9	28.7	34.2	1.4
102	52.4	2.1	36.9	3.0	24.7	1.0	19.0	.7	49.8	2.0	34.6	2.8	22.7	.9	16.9	.6	34.6	1.4	23.0	1.9	14.1	.5	9.6	.3	37.6	23.4	7.0	14.0	29.1	34.6	1.4
103	52.9	2.1	37.3	3.1	25.0	1.0	19.1	.7	50.3	2.0	34.9	2.8	22.9	.9	17.1	.6	34.9	1.4	23.2	1.9	14.2	.5	9.7	.3	37.9	23.6	7.1	14.2	29.3	34.9	1.4
104	53.4	2.2	37.6	3.1	25.2	1.0	19.3	.7	50.8	2.0	35.2	2.9	23.1	.9	17.2	.7	35.2	1.4	23.4	1.9	14.3	.5	9.7	.3	38.3	23.8	7.1	14.3	29.9	35.2	1.4
105	53.9	2.2	38.0	3.1	25.5	1.0	19.5	.7	51.3	2.1	35.6	2.9	23.4	.9	17.4	.7	35.6	1.4	23.6	1.9	14.4	.5	9.8	.3	38.7	24.1	7.2	14.4	30.2	35.6	1.4
106	54.4	2.2	38.3	3.2	25.7	1.0	19.7	.8	51.8	2.1	35.9	2.9	23.6	.9	17.6	.7	35.9	1.4	23.8	1.9	14.6	.5	9.9	.3	39.0	24.3	7.3	14.6	30.5	35.9	1.4
107	54.9	2.2	38.7	3.2	26.0	1.0	19.9	.8	52.3	2.1	36.2	3.0	23.8	.9	17.7	.7	36.2	1.4	24.0	1.9	14.7	.5	10.0	.4	39.4	24.5	7.3	14.7	30.7	36.2	1.4
108	55.5	2.2	39.1	3.2	26.2	1.0	20.0	.8	52.8	2.1	36.6	3.0	24.0	.9	17.9	.7	36.6	1.4	24.2	2.0	14.9	.5	10.1	.4	39.8	24.8	7.4	14.8	31.1	36.6	1.4
109	56.0	2.3	39.5	3.2	26.4	1.0	20.3	.8	53.3	2.1	36.9	3.0	24.3	.9	18.1	.7	36.9	1.4	24.4	2.0	15.0	.6	10.2	.4	40.1	25.0	7.5	15.0	31.3	36.9	1.4
110	56.5	2.3	39.8	3.3	26.7	1.0	20.5	.8	53.8	2.2	37.2	3.0	24.5	1.0	18.2	.7	37.2	1.5	24.6	2.0	15.2	.6	10.3	.4	40.5	25.2	7.6	15.2	31.6	37.2	1.5
111	57.0	2.3	40.2	3.3	26.9	1.1	20.6	.8	54.3	2.2	37.6	3.1	24.7	1.0	18.4	.7	37.6	1.5	24.8	2.0	15.3	.6	10.4	.4	40.9	25.5	7.6	15.3	31.9	37.6	1.5
112	57.5	2.3	40.5	3.3	27.2	1.1	20.8	.8	54.8	2.2	37.9	3.1	25.0	1.0	18.6	.7	37.9	1.5	25.0	2.0	15.4	.6	10.5	.4	41.3	25.7	7.7	15.4	32.2	37.9	1.5
113	58.1	2.3	40.9	3.3	27.4	1.1	21.0	.8	55.3	2.2	38.3	3.2	25.2	1.0	18.8	.7	38.3	1.5	25.3	2.0	15.6	.6	10.6	.4	41.7	25.9	7.8	15.6	32.5	38.3	1.5
114	58.5	2.4	41.3	3.4	27.7	1.1	21.2	.8	55.8	2.2	38.6	3.2	25.3	1.0	19.0	.7	38.6	1.5	25.5	2.1	15.7	.6	10.7	.4	42.0	26.1	7.8	15.7	32.8	38.6	1.5
115	59.1	2.4	41.6	3.4	27.9	1.1	21.4	.8	56.2	2.3	38.9	3.2	25.6	1.0	19.1	.7	38.9	1.5	25.7	2.1	15.8	.6	10.8	.4	42.4	26.4	7.9	15.8	33.1	38.9	1.5

MERCHANT SHIPS, *3rd Example* (*Continued.*)

Length.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.														
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
116	59.6	2.4	42.0	3.4	28.1	1.1	21.6	.8	56.7	2.3	39.3	3.2	25.8	1.0	19.2	.7	39.3	1.5	25.9	2.1	16.0	.6	10.9	.4	42.8	26.6	8.0	16.0	33.4	39.3	1.5
117	60.1	2.4	42.4	3.4	28.4	1.1	21.7	.8	57.2	2.3	39.7	3.3	26.0	1.0	19.4	.7	39.7	1.5	26.2	2.1	16.2	.6	11.0	.4	43.1	26.9	8.1	16.2	33.6	39.7	1.5
118	60.6	2.4	42.7	3.5	28.6	1.1	21.9	.8	57.7	2.3	40.0	3.3	26.2	1.0	19.6	.8	40.0	1.5	26.4	2.1	16.3	.6	11.1	.4	43.5	27.1	8.1	16.3	33.9	40.0	1.5
119	61.1	2.5	43.1	3.5	28.9	1.1	22.1	.9	58.2	2.3	40.3	3.3	26.5	1.0	19.8	.8	40.3	1.6	26.6	2.2	16.4	.6	11.2	.4	43.9	27.3	8.2	16.4	34.2	40.3	1.6
120	61.6	2.5	43.5	3.5	29.1	1.1	22.3	.9	58.7	2.4	40.7	3.3	26.7	1.0	19.9	.8	40.7	1.6	26.8	2.2	16.6	.6	11.3	.4	44.2	27.6	8.3	16.6	34.5	40.7	1.6
121	62.2	2.5	43.8	3.6	29.4	1.2	22.5	.9	59.2	2.4	41.0	3.4	26.9	1.1	20.1	.8	41.0	1.6	27.1	2.2	16.7	.6	11.3	.4	44.6	27.8	8.3	16.7	34.8	41.0	1.6
122	62.7	2.5	44.2	3.6	29.6	1.2	22.7	.9	59.7	2.4	41.3	3.4	27.1	1.1	20.2	.8	41.3	1.6	27.5	2.2	16.8	.6	11.4	.4	45.0	28.0	8.4	16.8	35.1	41.3	1.6
123	63.2	2.5	44.5	3.6	29.8	1.2	22.8	.9	60.2	2.4	41.7	3.4	27.4	1.1	20.4	.8	41.7	1.6	27.7	2.2	17.0	.6	11.5	.4	45.3	28.2	8.5	17.0	35.4	41.7	1.6
124	63.7	2.6	44.9	3.7	30.1	1.2	23.1	.9	60.7	2.4	42.0	3.4	27.6	1.1	20.6	.8	42.0	1.6	27.9	2.3	17.1	.6	11.6	.4	45.7	28.4	8.5	17.1	35.7	42.0	1.6
125	64.2	2.6	45.2	3.7	30.3	1.2	23.2	.9	61.2	2.5	42.4	3.5	27.8	1.1	20.7	.8	42.4	1.6	28.2	2.3	17.2	.6	11.7	.4	46.0	28.7	8.6	17.2	36.0	42.4	1.6
126	64.8	2.6	45.6	3.7	30.6	1.2	23.4	.9	61.6	2.5	42.7	3.5	28.0	1.1	20.9	.8	42.7	1.6	28.4	2.3	17.4	.6	11.8	.4	46.4	28.9	8.7	17.4	36.2	42.7	1.6
127	65.3	2.6	46.0	3.8	30.8	1.2	23.6	.9	62.1	2.5	43.1	3.5	28.2	1.1	21.1	.8	43.1	1.6	28.6	2.3	17.5	.6	11.9	.4	46.8	29.1	8.8	17.6	36.5	43.1	1.6
128	65.8	2.7	46.3	3.8	31.1	1.2	23.8	.9	62.6	2.5	43.4	3.5	28.5	1.1	21.2	.8	43.4	1.7	28.9	2.3	17.7	.6	12.0	.4	47.1	29.4	8.8	17.7	36.8	43.4	1.7
129	66.3	2.7	46.7	3.8	31.3	1.2	24.0	.9	63.1	2.5	43.8	3.6	28.7	1.1	21.4	.8	43.8	1.7	29.1	2.4	17.8	.6	12.1	.4	47.5	29.6	8.9	17.8	37.1	43.8	1.7
130	66.8	2.7	47.1	3.9	31.5	1.2	24.2	.9	63.6	2.6	44.1	3.6	28.9	1.1	21.6	.8	44.1	1.7	29.3	2.4	17.9	.7	12.2	.5	47.9	29.8	9.0	18.0	37.4	44.1	1.7
131	67.3	2.7	47.4	3.9	31.8	1.3	24.4	.9	64.1	2.6	44.4	3.6	29.1	1.1	21.7	.8	44.4	1.7	29.5	2.4	18.1	.7	12.3	.5	48.3	30.0	9.0	18.1	37.7	44.4	1.7
132	67.8	2.7	47.8	3.9	32.0	1.3	24.6	1.0	64.6	2.6	44.8	3.7	29.3	1.2	21.9	.8	44.8	1.7	29.8	2.4	18.2	.7	12.4	.5	48.6	30.3	9.1	18.2	38.0	44.8	1.7
133	68.4	2.8	48.2	4.0	32.3	1.3	24.8	1.0	65.1	2.6	45.1	3.7	29.6	1.2	22.1	.9	45.1	1.7	30.0	2.4	18.4	.7	12.5	.5	49.0	30.6	9.2	18.4	38.3	45.1	1.7
134	68.9	2.8	48.5	4.0	32.6	1.3	25.0	1.0	65.6	2.6	45.4	3.7	29.8	1.2	22.2	.9	45.4	1.7	30.3	2.5	18.5	.7	12.6	.5	49.4	30.8	9.2	18.5	38.6	45.4	1.7
135	69.4	2.8	48.9	4.0	32.8	1.3	25.1	1.0	66.1	2.7	45.8	3.7	30.0	1.2	22.4	.9	45.8	1.7	30.5	2.5	18.6	.7	12.7	.5	49.7	31.0	9.3	18.6	38.9	45.8	1.7
136	70.0	2.8	49.2	4.0	33.0	1.3	25.3	1.0	66.6	2.7	46.1	3.8	30.2	1.2	22.6	.9	46.1	1.8	30.7	2.5	18.8	.7	12.8	.5	50.1	31.2	9.4	18.8	39.1	46.1	1.8
137	70.5	2.8	49.6	4.1	33.3	1.3	25.5	1.0	67.0	2.7	46.4	3.8	30.5	1.2	22.8	.9	46.4	1.8	30.9	2.5	18.9	.7	12.9	.5	50.5	31.5	9.5	19.0	39.4	46.4	1.8
138	71.0	2.9	50.0	4.1	33.6	1.3	25.7	1.0	67.5	2.7	46.8	3.8	30.7	1.2	23.0	.9	46.8	1.8	31.2	2.5	19.1	.7	13.0	.5	50.9	31.7	9.5	19.1	39.7	46.8	1.8
139	71.5	2.9	50.4	4.1	33.8	1.3	25.9	1.0	68.0	2.7	47.1	3.9	30.9	1.2	23.1	.9	47.1	1.8	31.4	2.6	19.2	.7	13.1	.5	51.3	31.9	9.6	19.2	40.0	47.1	1.8
140	72.0	2.9	50.7	4.2	34.0	1.4	26.1	1.0	68.5	2.8	47.5	3.9	31.1	1.2	23.2	.9	47.5	1.8	31.6	2.6	19.3	.7	13.2	.5	51.7	32.2	9.7	19.4	40.3	47.5	1.8

BARQUES, *2nd Example* (*Continued*).

[Fig. 32, Pl. I.

Length of Ship.	Main-yards.								Fore-yards.								Driver-boom.	Gaff.	Top-sail-gaff.	Main try-sail-gaff.	Fore try-sail-gaff.	Sprit-sail-yard.	Arm.	Swing-boom.
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.								
98	52.7	2.2	40.8	3.4	26.45	1.1	19.2	0.80	50.05	2.08	38.7	3.22	25.4	1.05	18.3	0.76	36.2	22.9	15.25	16.25	17.8	38.7	1.61	31.62
99	53.3	2.22	41.2	3.43	26.75	1.11	19.4	0.80	50.55	2.1	39.1	3.25	25.65	1.06	18.5	0.77	36.6	23.1	15.4	16.4	18.0	39.1	1.62	31.98
100	53.8	2.24	41.6	3.46	27.05	1.12	19.6	0.81	51.1	2.12	39.5	3.29	25.9	1.07	18.7	0.77	37.0	23.36	15.55	16.6	18.15	39.5	1.64	32.28
101	54.35	2.26	42.1	3.5	27.3	1.13	19.8	0.82	51.6	2.14	39.9	3.32	26.2	1.08	18.9	0.78	37.3	23.6	15.7	16.75	18.3	39.9	1.66	32.61
102	54.9	2.28	42.45	3.54	27.55	1.14	20.0	0.83	52.1	2.16	40.30	3.35	26.4	1.1	19.1	0.79	37.65	23.85	15.85	16.9	18.5	40.30	1.67	32.94
103	55.4	2.3	42.85	3.57	27.8	1.15	20.15	0.84	52.6	2.18	40.68	3.39	26.7	1.11	19.25	0.80	38.0	24.1	16.0	17.05	18.7	40.68	1.69	33.24
104	55.95	2.32	43.25	3.6	28.05	1.16	20.3	0.84	53.1	2.2	41.05	3.42	26.95	1.12	19.45	0.81	38.35	24.3	16.15	17.2	18.9	41.05	1.71	33.57
105	56.45	2.34	43.7	3.64	28.35	1.17	20.5	0.85	53.6	2.22	41.45	3.45	27.2	1.13	19.65	0.82	38.75	24.5	16.3	17.4	19.05	41.45	1.72	33.87
106	57.05	2.36	44.1	3.67	28.62	1.18	20.7	0.86	54.13	2.24	41.85	3.48	27.5	1.14	19.85	0.82	39.1	24.75	16.45	17.55	19.25	41.85	1.74	34.23
107	57.6	2.38	44.5	3.7	28.9	1.2	20.9	0.86	54.65	2.26	42.25	3.52	27.75	1.15	20.05	0.83	39.5	25.0	16.6	17.7	19.45	42.25	1.76	34.54
108	58.1	2.4	44.9	3.74	29.2	1.21	21.1	0.87	55.2	2.28	42.65	3.55	28.0	1.16	20.25	0.84	39.9	25.2	16.8	17.94	19.6	42.65	1.77	34.86
109	58.65	2.43	45.4	3.78	29.45	1.22	21.3	0.88	55.7	2.31	43.05	3.58	28.25	1.17	20.4	0.85	40.25	25.45	17.0	18.1	19.8	43.05	1.79	35.19
110	59.2	2.46	45.8	3.82	29.7	1.23	21.5	0.89	56.2	2.34	43.45	3.62	28.5	1.18	20.6	0.86	40.6	25.7	17.1	18.25	20.0	43.45	1.81	35.52
111	59.7	2.48	46.2	3.85	30.05	1.24	21.7	0.9	56.7	2.36	43.85	3.65	28.75	1.19	20.8	0.86	41.0	25.95	17.25	18.4	20.2	43.85	1.82	35.82
112	60.35	2.51	46.6	3.89	30.35	1.25	21.9	0.91	57.2	2.38	44.25	3.68	29.05	1.2	21.0	0.87	41.35	26.15	17.4	18.6	20.35	44.25	1.84	36.21
113	60.9	2.54	47.1	3.92	30.6	1.26	22.1	0.92	57.7	2.41	44.65	3.72	29.3	1.21	21.2	0.88	41.7	26.4	17.55	18.75	20.55	44.65	1.86	36.54
114	61.4	2.56	47.5	3.95	30.9	1.27	22.3	0.92	58.25	2.43	45.05	3.75	29.55	1.22	21.35	0.89	42.1	26.65	17.7	18.9	20.7	45.05	1.87	36.84
115	62.0	2.58	47.9	3.99	31.1	1.28	22.5	0.93	58.75	2.45	45.45	3.78	29.83	1.24	21.55	0.89	42.45	26.85	17.9	19.1	20.9	45.45	1.89	37.2
116	62.5	2.60	48.3	4.02	31.25	1.29	22.7	0.94	59.3	2.47	45.85	3.82	30.2	1.25	21.75	0.90	42.85	27.1	18.05	19.25	21.1	45.85	1.91	37.5
117	63.1	2.62	48.7	4.05	31.6	1.3	22.9	0.95	59.8	2.49	46.25	3.85	30.4	1.26	21.95	0.91	43.2	27.35	18.2	19.45	21.25	46.25	1.92	37.8
118	63.6	2.64	49.1	4.09	31.9	1.32	23.1	0.96	60.4	2.51	46.65	3.88	30.65	1.27	22.1	0.91	43.55	27.6	18.35	19.6	21.45	46.65	1.94	38.16
119	64.2	2.67	49.5	4.12	32.2	1.33	23.3	0.97	60.9	2.53	47.05	3.92	30.95	1.28	22.3	0.92	44.0	27.85	18.5	19.75	21.65	47.05	1.96	38.46
120	64.7	2.7	49.9	4.15	32.45	1.35	23.5	0.97	61.4	2.55	47.45	3.95	31.15	1.29	22.5	0.93	44.35	28.05	18.7	19.95	21.82	47.45	1.97	38.76
121	65.2	2.72	50.35	4.19	32.7	1.36	23.7	0.98	61.9	2.58	47.85	3.98	31.4	1.3	22.7	0.94	44.7	28.3	18.85	20.1	22.0	47.85	1.99	39.12
122	65.8	2.74	50.8	4.23	33.0	1.37	23.9	0.99	62.4	2.6	48.25	4.02	31.65	1.32	22.85	0.95	45.1	28.5	19.0	20.25	22.15	48.25	2.01	39.48
123	66.3	2.76	51.2	4.26	33.3	1.38	24.1	1.0	62.9	2.62	48.65	4.05	31.9	1.33	23.1	0.96	45.45	28.77	19.15	20.4	22.4	48.65	2.02	39.78
124	66.85	2.78	51.6	4.3	33.55	1.39	24.3	1.02	63.4	2.64	49.05	4.08	32.2	1.34	23.3	0.97	45.85	29.05	19.3	20.6	22.6	49.05	2.04	40.11
125	67.35	2.8	52.1	4.34	33.85	1.4	24.5	1.02	63.9	2.66	49.45	4.12	32.45	1.35	23.45	0.97	46.2	29.23	19.45	20.75	22.75	49.45	2.06	40.41

BARQUES, 2nd *Example*; MASTS, &c.

[Fig. 32, Pl. I.

Breadth of Ship.	LOWER-MASTS.									TOP-MASTS.						TOP-GALLANT MASTS.				Bowsprit.	Jib-boom.	Flying-jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.				
	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Hounded	Headed.	Hounded	Pole.	Hounded	Pole.	Hounded	Pole.			
18.	36.0	7.1	8.6	34.2	6.8	8.6	35.8	5.7	8.6	20.6	3.3	19.5	3.1	18.4	4.55	13.6	11.1	13.0	10.0	24.0	22.0	7.28
18.5	37.0	7.3	8.8	35.1	7.0	8.8	36.8	5.85	8.8	21.2	3.43	20.05	3.2	18.9	4.7	14.0	11.35	13.3	10.2	24.65	22.6	7.45
19.	38.0	7.5	9.1	36.05	7.15	9.1	37.8	6.05	9.1	21.75	3.53	20.6	3.3	19.4	4.8	14.35	11.65	13.7	10.5	25.3	23.2	7.7
19.5	39.0	7.7	9.3	37.0	7.35	9.3	38.7	6.2	9.3	22.3	3.63	21.1	3.38	19.9	4.92	14.78	11.95	14.05	10.8	25.95	23.8	7.9
20.	40.0	7.9	9.55	38.0	7.55	9.55	39.7	6.35	9.55	22.9	3.7	21.65	3.45	20.4	5.05	15.1	12.3	14.4	11.05	26.6	24.4	8.1
20.5	41.0	8.1	9.8	39.0	7.7	9.8	40.7	6.5	9.8	23.5	3.8	22.2	3.55	20.95	5.2	15.55	12.6	14.78	11.35	27.3	25.1	8.3
21.	42.0	8.3	10.05	39.9	7.9	10.05	41.7	6.7	10.05	24.1	3.9	22.75	3.63	21.5	5.33	15.95	12.9	15.1	11.6	27.95	25.7	8.5
21.5	43.0	8.5	10.3	40.8	8.1	10.3	42.7	6.85	10.3	24.7	3.98	23.3	3.7	22.	5.42	16.3	13.25	15.5	11.85	28.6	26.3	8.7
22.	44.0	8.7	10.55	41.7	8.3	10.55	43.7	7.0	10.55	25.2	4.03	23.8	3.8	22.5	5.58	16.7	13.53	15.85	12.15	29.3	26.9	8.9
22.5	45.0	8.9	10.75	42.7	8.5	10.75	44.7	7.15	10.75	25.8	4.13	24.4	3.9	23.05	5.69	17.05	13.83	16.2	12.4	29.99	27.5	9.1
23.	46.0	9.1	11.0	43.65	8.7	11.0	45.7	7.35	11.0	26.4	4.25	24.9	4.0	23.55	5.8	17.4	14.15	16.55	12.7	30.7	28.1	9.3
23.5	47.0	9.3	11.25	44.55	8.85	11.25	46.6	7.45	11.25	26.9	4.33	25.4	4.06	24.05	5.92	17.8	14.42	16.9	12.95	31.3	28.7	9.5
24.	48.0	9.5	11.5	45.5	9.05	11.5	47.6	7.65	11.5	27.5	4.41	25.95	4.15	24.55	6.05	18.2	14.75	17.25	13.25	31.9	29.3	9.7
24.5	49.0	9.7	11.75	46.45	9.25	11.75	48.55	7.8	11.75	28.1	4.5	26.5	4.23	25.05	6.2	18.55	15.05	17.6	13.55	32.6	29.99	9.9
25.	50.0	9.9	12.0	47.4	9.45	12.0	49.55	7.95	12.0	28.6	4.62	27.05	4.31	25.55	6.35	18.95	15.4	18.0	13.8	33.3	30.6	10.1
25.5	51.0	10.1	12.25	48.35	9.65	12.25	50.55	8.1	12.25	29.2	4.7	27.65	4.4	26.05	6.47	19.35	15.7	18.35	14.1	33.9	31.2	10.3
26.	52.0	10.3	12.5	49.3	9.85	12.5	51.6	8.3	12.5	29.7	4.78	28.2	4.5	26.55	6.6	19.7	16.0	18.75	14.35	34.6	31.8	10.5
26.5	53.0	10.5	12.75	50.25	10.05	12.75	52.55	8.45	12.75	30.65	4.88	28.7	4.6	27.1	6.7	20.1	16.3	19.1	14.65	35.3	32.3	10.7
27.	54.0	10.7	13.0	51.2	10.25	13.0	53.6	8.6	13.0	31.0	4.98	29.25	4.7	27.6	6.85	20.5	16.6	19.45	14.9	35.9	33.0	10.9
27.5	55.0	10.9	13.25	52.15	10.4	13.25	54.6	8.78	13.25	31.5	5.09	29.85	4.78	28.1	7.05	20.85	16.9	19.8	15.2	36.65	33.6	11.1
28.	56.0	11.1	13.5	53.1	10.6	13.5	55.6	9.0	13.5	32.1	5.15	30.4	4.85	28.65	7.13	21.25	17.25	20.2	15.5	37.3	34.25	11.35
28.5	57.0	11.3	13.75	54.05	10.8	13.75	56.6	9.1	13.75	32.65	5.25	31.0	4.92	29.15	7.25	21.65	17.6	20.6	15.8	37.95	34.85	11.5
29.	58.0	11.5	14.0	55.0	11.0	14.0	57.6	9.25	14.0	33.25	5.33	31.5	5.0	29.7	7.35	22.05	17.85	20.95	16.05	38.65	35.4	11.75
29.5	59.0	11.7	14.2	56.0	11.2	14.2	58.6	9.4	14.2	33.8	5.38	31.95	5.1	30.2	7.5	22.35	18.15	21.3	16.3	39.3	36.05	12.0
30.	60.0	11.9	14.4	57.0	11.4	14.4	59.5	9.55	14.4	34.4	5.5	32.55	5.2	30.7	7.6	22.75	18.45	21.65	16.6	39.9	36.7	12.15
30.5	61.0	12.1	14.65	57.9	11.6	14.65	60.6	9.7	14.65	34.95	5.58	33.1	5.3	31.25	7.75	23.15	18.8	21.98	16.9	40.6	37.3	12.35
31.	62.0	12.3	14.86	58.75	11.8	14.86	61.5	9.85	14.86	35.45	5.65	33.6	5.37	31.7	7.88	23.5	19.05	22.3	17.1	41.2	37.8	12.55
31.5	63.0	12.5	15.1	59.7	12.0	15.1	62.5	10.0	15.1	36.05	5.75	34.15	5.43	32.2	8.0	23.85	19.4	22.7	17.4	41.9	38.45	12.77
32.	64.0	12.7	15.32	60.7	12.15	15.32	63.5	10.15	15.32	36.7	5.85	34.7	5.52	32.7	8.15	24.25	19.7	23.1	17.7	42.55	39.05	12.98
32.5	65.0	12.9	15.6	61.6	12.3	15.6	64.45	10.32	15.6	37.2	5.93	35.15	5.6	33.2	8.25	24.6	19.95	23.4	18.0	43.2	39.65	13.15
33.	66.0	13.1	15.82	62.55	12.48	15.82	65.4	10.5	15.82	37.8	6.02	35.75	5.7	33.75	8.4	25.05	20.3	23.8	18.25	43.9	40.3	13.4
33.5	67.0	13.3	16.1	63.55	12.65	16.1	66.4	10.7	16.1	38.4	6.1	36.3	5.76	34.28	8.5	25.4	20.6	24.15	18.5	44.6	40.9	13.6
34.	68.0	13.5	16.32	64.55	12.9	16.32	67.4	10.85	16.32	38.95	6.2	36.9	5.86	34.8	8.66	25.8	20.95	24.5	18.8	45.3	41.55	13.8
34.5	69.0	13.7	16.5	65.4	13.1	16.5	68.4	11.0	16.5	39.5	6.28	37.4	5.95	35.25	8.73	26.2	21.2	24.88	19.05	45.9	42.1	14.0
35.	70.0	13.9	16.75	66.35	13.25	16.75	69.35	11.15	16.75	40.1	6.35	37.9	6.05	35.8	8.9	26.6	21.55	25.2	19.3	46.5	42.75	14.2

MERCHANT SHIPS; 1st *Example.*

Dimensions of Ship.	Main-yards.								Fore-yards.								Mizen-yards.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-g'llant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
120	63.15	2.64	45.65	3.75	30.85	1.28	23.7	1.0	56.9	2.35	41.1	3.39	27.8	1.1	21.35	.9	41.1	1.66	30.3	2.55	20.6	.9	15.78	.65	45.65	33.35	10.	20.05	35.2	41.1	1.66
121	63.7	2.65	46.0	3.77	31.1	1.29	23.87	1.01	57.4	2.37	41.4	3.4	28.	1.12	21.5	.9	41.4	1.68	30.6	2.57	20.75	.9	15.9	.65	46.	33.6	10.1	20.2	35.5	41.4	1.68
122	64.25	2.67	46.35	3.81	31.32	1.30	24.05	1.02	57.85	2.39	41.73	3.43	28.2	1.13	21.7	.91	41.73	1.7	30.9	2.59	20.95	.91	16.05	.66	46.35	33.9	10.2	20.35	35.8	41.73	1.7
123	64.75	2.68	46.72	3.83	31.6	1.31	24.23	1.03	58.3	2.41	42.1	3.47	28.45	1.15	21.85	.91	42.1	1.71	31.15	2.61	21.1	.91	16.15	.67	46.72	34.15	10.25	20.5	36.05	42.1	1.71
124	65.25	2.7	47.1	3.85	31.85	1.32	24.41	1.04	58.8	2.43	42.45	3.5	28.7	1.16	22.05	.92	42.45	1.73	31.4	2.63	21.3	.92	16.3	.67	47.1	34.45	10.33	20.65	36.35	42.45	1.73
125	65.8	2.72	47.5	3.87	32.15	1.33	24.63	1.05	59.3	2.45	42.8	3.54	28.95	1.17	22.2	.92	42.8	1.75	31.65	2.65	21.45	.92	16.45	.68	47.5	34.8	10.4	20.85	36.65	42.8	1.75
126	66.35	2.75	47.9	3.9	32.4	1.34	24.85	1.06	59.8	2.47	43.12	3.58	29.2	1.18	22.4	.93	43.12	1.77	31.9	2.67	21.65	.93	16.55	.68	47.9	35.05	10.5	21.05	36.95	43.12	1.77
127	66.85	2.78	48.25	3.93	32.65	1.35	25.05	1.07	60.25	2.49	43.5	3.60	29.4	1.19	22.55	.93	43.5	1.79	32.15	2.69	21.8	.93	16.7	.69	48.25	35.3	10.6	21.2	37.25	43.5	1.79
128	67.35	2.8	48.65	3.96	32.9	1.36	25.22	1.08	60.7	2.51	43.8	3.64	29.65	1.21	22.7	.94	43.8	1.81	32.4	2.71	22.	.94	16.8	.69	48.65	35.6	10.7	21.35	37.55	43.8	1.81
129	67.9	2.82	49.05	3.99	33.15	1.37	25.45	1.09	61.2	2.53	44.2	3.69	29.9	1.23	22.9	.94	44.2	1.83	32.7	2.73	22.15	.95	16.98	.69	49.05	35.9	10.78	21.5	37.8	44.2	1.83
130	68.4	2.84	49.4	4.1	33.4	1.38	25.65	1.1	61.6	2.55	44.5	3.72	30.1	1.25	23.1	.95	44.5	1.85	33.	2.75	22.3	.95	17.1	.70	49.4	36.15	10.83	21.65	38.1	44.5	1.85
131	68.95	2.86	49.75	4.13	33.65	1.39	25.8	1.12	62.1	2.57	44.83	3.75	30.3	1.26	23.25	.96	44.83	1.87	33.2	2.77	22.45	.95	17.2	.70	49.75	36.4	10.92	21.8	38.4	44.83	1.87
132	69.5	2.88	50.15	4.16	33.95	1.40	26.05	1.13	62.6	2.59	45.2	3.79	30.6	1.27	23.45	.97	45.2	1.88	33.4	2.79	22.65	.96	17.33	.71	50.15	36.7	11.05	22.	38.7	45.2	1.88
133	70.05	2.9	50.6	4.19	34.22	1.41	26.25	1.14	63.1	2.61	45.58	3.82	30.83	1.27	23.65	.98	45.58	1.89	33.7	2.81	22.85	.96	17.5	.71	50.6	37.	11.1	22.2	39.05	45.58	1.89
134	70.6	2.93	50.95	4.22	34.45	1.43	26.43	1.15	63.5	2.63	45.9	3.84	31.05	1.28	23.8	.99	45.9	1.9	33.94	2.83	23.05	.97	17.62	.72	50.95	37.25	11.2	22.35	39.3	45.9	1.9
135	71.05	2.96	51.3	4.25	34.7	1.44	26.62	1.16	64.05	2.65	46.2	3.87	31.3	1.29	24.05	1.	46.2	1.92	34.2	2.85	23.15	.97	17.75	.72	51.3	37.5	11.25	22.5	39.6	46.2	1.92
136	71.6	2.99	51.7	4.29	34.95	1.45	26.8	1.17	64.5	2.67	46.53	3.9	31.5	1.30	24.2	1.01	46.53	1.93	34.45	2.87	23.33	.98	17.85	.72	51.7	37.8	11.35	22.7	39.9	46.53	1.93
137	72.13	3.02	52.1	4.33	35.23	1.46	27.05	1.17	64.98	2.7	46.9	3.93	31.75	1.31	24.35	1.02	46.9	1.94	34.7	2.89	23.55	.98	18.	.73	52.1	38.1	11.45	22.85	40.2	46.9	1.94
138	72.7	3.04	52.5	4.37	35.5	1.47	27.22	1.18	65.45	2.73	47.23	3.96	32.	1.32	24.55	1.03	47.23	1.96	34.95	2.91	23.7	.99	18.15	.74	52.5	38.4	11.5	23.05	40.5	47.23	1.96
139	73.25	3.05	52.88	4.4	35.75	1.48	27.4	1.19	65.95	2.75	47.55	3.99	32.2	1.33	24.7	1.04	47.55	1.98	35.2	2.93	23.88	.99	18.3	.74	52.88	38.7	11.6	23.2	40.75	47.55	1.98
140	73.73	3.06	53.25	4.42	36.	1.49	27.6	1.2	66.4	2.77	47.95	4.02	32.45	1.34	24.9	1.05	47.95	1.99	35.5	2.95	24.05	1.0	18.4	.75	53.25	39.	11.7	23.35	41.05	47.95	1.99
141	74.22	3.08	53.6	4.45	36.25	1.5	27.8	1.21	66.83	2.79	48.25	4.05	32.7	1.35	25.1	1.05	48.25	2.1	35.75	2.97	24.25	1.0	18.55	.75	53.65	39.2	11.8	23.5	41.35	48.25	2.1
142	74.8	3.1	54.05	4.48	36.55	1.52	28.0	1.22	67.35	2.8	48.6	4.08	32.95	1.36	25.25	1.06	48.6	2.3	36.05	2.99	24.4	1.10	18.7	.76	54.05	39.5	11.85	23.7	41.65	48.6	2.3
143	75.35	3.13	54.4	4.51	36.8	1.53	28.2	1.23	67.85	2.82	48.9	4.11	33.15	1.37	25.45	1.06	48.9	2.4	36.25	3.02	24.6	1.10	18.83	.76	54.4	39.8	11.95	23.85	41.95	48.9	2.4
144	75.9	3.15	54.75	4.54	37.05	1.54	28.4	1.24	68.35	2.84	49.3	4.13	33.4	1.38	25.65	1.07	49.3	2.6	36.5	3.04	24.75	1.20	18.95	.77	54.75	40.05	12.05	24.05	42.2	49.3	2.6

MERCHANT SHIPS; 1st *Example (Continued.)*

Dimensions of Ship.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
145	76.35	3.18	55.1	4.57	37.28	1.55	28.6	1.25	68 8	2.86	49.6	4.16	33.6	1.39	25.8	1.07	49.6	2.8	36.75	3.07	24.9	1.02	19.1	.77	55.1	40.3	12.1	24.2	42.5	49.6	2.8
146	76 95	3.2	55.55	4.61	37.53	1.56	28.8	1.25	69.23	2.88	49.95	4.19	33.8	1.4	26.	1.08	49.95	2.9	37.	3.1	25.1	1.03	19.2	.78	55.55	40.6	12.2	24.35	42.8	49.9	2.9
147	77.45	3.22	55.9	4.64	37.8	1.57	29.05	1.26	69.7	2.90	50.3	4.22	34.1	1.41	26.15	1.08	50.3	2.10	37.25	3.12	25.23	1.03	19.33	.78	55.9	40.85	12.28	24.55	43.1	50.35	2.10
148	78.0	3.25	56.3	4.68	38.08	1.58	29.2	1.26	70.25	2.91	50.65	4.25	34.5	1.42	26.3	1.09	50.65	2.11	37.5	3.15	25.4	1.04	19.5	.79	56.3	41.15	12.33	24.7	43.4	50.65	2.11
149	78.5	3.28	56.7	4.71	38.35	1.59	29.4	1.27	70.7	2.93	50.98	4.28	34.6	1.43	26.5	1.09	50.98	2.12	37.75	3.18	25.58	1.04	19.65	.79	56.7	41.4	12.43	24.85	43.7	50.98	2.12
150	79.05	3.3	57.05	4.75	38.53	1.6	29.63	1.27	71.2	2.95	51.35	4.31	34.8	1.44	26.7	1.1	51.35	2.13	38.	3.2	25.75	1.05	19.75	.8	57.05	41.7	12.55	25.05	44.	51.35	2.13
151	79.6	3.32	57.48	4.78	38.85	1.61	29.8	1.28	71.7	2.97	51.7	4.34	35.	1.45	26.85	1.1	51.7	2.15	38.25	3.22	25.93	1.05	19.9	.8	57.48	42.	12.63	25.2	44.3	51.7	2.15
152	80.1	3.34	57.8	4.81	39.1	1.62	30.	1.28	72.1	2.99	52.	4.37	35.2	1.46	27.05	1.11	52.	2.17	38.5	3.24	26.1	1.06	20.05	.81	57.8	42.25	12.7	25.35	44 53	52.	2.17
153	80.6	3.36	58.2	4.84	39.35	1.63	30.15	1.29	72.6	3.01	52.35	4.39	35.45	1.47	27.2	1.11	52.35	2.18	38.75	3.26	26.25	1.06	20.15	.81	58.2	42.5	12.8	25.5	44.85	52.35	2.18
154	81.2	3.38	58.6	4.87	39.65	1.64	30.35	1.29	73.1	3.03	52.7	4.41	35.7	1.48	27.4	1.12	52·7	2.19	39.05	3.28	26.45	1.07	20.3	.82	58.6	42.78	12.85	25.65	45.1	52 7	2.19
155	81.7	3.4	59.	4.9	39.9	1.65	30.6	1.30	73.6	3.05	53.08	4.43	35.9	1.49	27.6	1 12	53.08	2.2	39.3	3.3	26.6	1.07	20.4	.82	59.	43.1	12.93	25.8	45.4	53.08	2.2
156	82.25	3.42	59.32	4.93	40.13	1.66	30.75	1.3	74.05	3.07	53.4	4.46	36.1	1.5	27.75	1.13	53.4	2.22	39.55	3.32	26.78	1.08	20.52	.83	59.32	43.35	13.05	26.	45.7	53.4	2.22
157	82 75	3.44	59.7	4.96	40.35	1.67	30.95	1.31	74.5	3.09	53.73	4.49	36.4	1.51	27.9	1.13	53.73	2.23	39.75	3.34	26.95	1.08	20.65	.83	59.7	43.6	13.1	26.15	46.	53.73	2.23
158	83.3	3.47	60.2	4.99	40.65	1.68	31.15	1.32	75.05	3.11	54.1	4.51	36.62	1.52	28.1	1.14	54.1	2.25	40.05	3.36	27.15	1.09	20.76	.84	60.2	43.9	13.2	26.3	46.25	54.1	2.25
159	83.85	3.5	60.5	5.02	40.9	1.69	31.35	1.32	75.5	3.13	54.48	4.53	36.85	1.53	28.25	1.14	54.48	2.27	40.25	3.38	27.3	1.09	20.9	.84	60.5	44.2	13.25	26.5	46.6	54.48	2.27
160	84.85	3.53	60.9	5.05	41.15	1.7	31.55	1.33	76.	3.15	54.8	4.55	37.1	1.54	28.45	1 15	54.8	2.29	40.55	3.4	27.5	1.1	21.05	.85	60.9	44.45	13.33	26.65	46.9	54.8	2.29
161	84.9	3.56	61.25	5.09	41.42	1.72	31.75	1.33	76.45	3.17	55.15	4.57	37.3	1.55	28.6	1.16	55.15	2.3	40.8	3.41	27.65	1.12	21.15	.86	61.25	44.75	13.42	26.8	47.15	55.15	2.3
162	85.45	3.58	61.65	5.12	41.7	1.73	31.95	1.34	76.95	3.19	55.5	4.6	37.55	1.56	28.8	1.17	55.5	2.32	41.05	3.42	27.85	1.13	21.3	.87	61.65	45.	13.5	27.0	47.45	55.5	2.32
163	85.98	3.6	62.05	5.15	41.95	1.75	32.15	1.34	77.4	3.21	55.85	4.63	37.8	1.57	29.	1.18	55.85	2 33	41.3	3.44	28.	1.14	21.4	.88	62.05	45.3	13.6	27.15	47.75	55.85	2.33
164	86.5	3.61	62.4	5.19	42.2	1.76	32.35	1.35	77.85	3.23	56.15	4.66	38.05	1.58	29.15	1.2	56.15	2.34	41.55	3.46	28.13	1.15	21.55	.89	62.4	45 55	13.65	27.3	48.	56.15	2.34
165	86.99	3.62	62.8	5.23	42.5	1.77	32.6	1.35	78.29	3.25	56.5	4.7	38.25	1.59	29 34	1.22	56.5	2.35	41.8	3.48	28.3	1.17	21.7	.90	62.8	45.84	13.75	27.5	48.3	56.5	2.35
166	87.55	3.66	63.25	5.27	42.73	1.79	32.8	1.36	78.8	3.29	56.85	4.72	38.5	1.60	29.55	1.23	56.85	2.37	42.05	3.52	28.45	1.18	21.8	.91	63.25	46.1	13.83	27.65	48.6	56.85	2.37
167	88.08	3.68	63.53	5.31	42.98	1.80	33.	1.38	79.28	3.29	57.15	4.74	38.72	1.61	29 7	1.25	57.15	2.39	42.3	3.56	28.65	1.18	21.93	.92	63.55	46.38	13.9	27.8	48.9	57.15	2.39
168	88.65	3.7	63.93	5.35	43.25	1.82	33.18	1.4	79.78	3.31	57.55	4.76	38.95	1.63	29.9	1.26	57.55	2.41	42.55	3.59	28.85	1.19	22.08	.93	63.93	46.65	14.0	28.	49.2	57.55	2.41
169	89.1	3.72	64.3	5.38	43.48	1.83	33.33	1.41	80.2	3.32	57.83	4.78	39.15	1.64	30.05	1.27	57.83	2.43	42.8	3.61	29.05	1.19	22.22	.94	64.3	46.9	14.05	28.15	49.5	57.83	2.43
170	89.65	3 76	64.67	5.4	43.78	1.85	33.52	1.43	80.7	3.34	58.2	4.8	39.4	1.65	30.22	1.28	58.2	2.45	43.05	3.64	29.2	1.2	22.35	.95	64.67	47.2	14.15	28.3	49.8	58.2	2.45

MERCHANT SHIPS; 1st *Example.*

Dimensions of Ship.	LOWER-MASTS.									TOP-MASTS.						TOP-GALLANT MASTS.						ROYAL-MASTS.						Bowsprit.	Jib-boom.	Flying jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore		Mizen.				
Breadth.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed.	Hounded.	Headed.	Housed to Qr.-deck.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed	Hounded.	Headed.	Hounded.	Headed.			
30.	60.6	12.1	14.65	54.58	10.88	13.9	50.65	8.18	9.63	38.65	6.25	34.9	5.6	25.55	3.58	19.1	2.75	17.15	2.45	12.4	1.78	12.73	2.11	11.8	2.0	8.5	1.35	43.78	30.95	31.6
30.5	61.6	12.3	14.9	55.45	11.05	14.1	51.5	8.3	9.78	39.25	6.35	35.45	5.7	26.0	3.63	19.4	2.8	17.43	2.48	12.6	1.81	12.95	2.15	12.	2.03	8.65	1.38	44.46	31.45	32.1
31.	62.65	12.5	15.1	56.42	11.24	14.4	52.40	8.43	9.95	39.95	6.48	36.08	5.8	26.4	3.7	19.75	2.83	17.75	2.51	12.8	1.84	13.15	2.19	12.2	2.06	8.78	1.4	45.2	32.05	32.65
31.5	63.68	12.7	15.35	57.4	11.4	14.6	53.25	8.58	10.1	40.6	6.58	36.65	5.9	26.82	3.76	20.05	2.87	18.05	2.55	13.05	1.87	13.35	2.22	12.4	2.09	8.9	1.43	45.95	32.52	33.2
32.	64.7	12.9	15.65	58.35	11.63	14.88	54.15	8.72	10.3	41.28	6.7	37.25	6.	27.3	3.82	20.45	2.92	18.35	2.59	13.25	1.9	13.63	2.26	12.6	2.1	9.05	1.45	46.7	33.1	33.75
32.5	65.8	13.1	15.85	59.25	11.79	15.1	55.05	8.87	10.45	41.95	6.8	37.82	6.1	27.7	3.89	20.75	2.98	18.65	2.65	13.45	1.94	13.8	2.3	12.8	2.13	9.2	1.47	47.45	33.6	34.25
33.	66.85	13.3	16.15	60.25	12.05	15.35	55.9	9.05	10.65	42.65	6.91	38.45	6.2	28.15	3.94	21.1	3.05	18.95	2.7	13.65	1.98	14.05	2.33	13.	2.17	9.35	1.5	48.2	34.15	34.85
33.5	67.85	13.5	16.35	61.1	12.15	15.55	56.7	9.15	10.75	43.2	7.02	39.	6.3	28.5	4.05	21.35	3.09	19.2	2.75	13.85	2.0	14.25	2.36	13.2	2.21	9.5	1.53	48.9	34.6	35.3
34.	68.85	13.7	16.65	62.	12.33	15.8	57.58	9.3	10.95	43.9	7.1	39.6	6.4	29.	4.1	21.75	3.13	19.53	2.8	14.1	2.02	14.5	2.4	13.4	2.25	9.65	1.55	49.65	35.2	35.9
34.5	69.85	13.9	16.85	62.9	12.52	16.05	58.37	9.43	11.1	44.5	7.2	40.2	6.5	29.4	4.13	22.05	3.15	19.8	2.85	14.3	2.05	14.7	2.45	13.6	2.28	9.8	1.58	50.35	35.65	36.35
35.	70.85	14.1	17.1	63.8	12.7	16.28	59.25	9.55	11.3	45.15	7.31	40.75	6.6	29.85	4.21	22.35	3.18	20.1	2.9	14.5	2.08	14.93	2.5	13.8	2.3	9.95	1.6	51.1	36.2	36.95
35.5	71.80	14.3	17.33	64.7	12.88	16.5	60.05	9.68	11.45	45.75	7.42	41.3	6.68	30.25	4.26	22.65	3.23	20.35	2.95	14.7	2.1	15.1	2.53	14.	2.33	10.05	1.63	51.8	36.68	37.4
36.	72.85	14.53	17.6	65.6	13.1	16.73	60.9	9.85	11.6	46.4	7.54	41.9	6.75	30.7	4.33	23.	3.29	20.65	3.	14.9	2.13	15.33	2.58	14.2	2.36	10.25	1.66	52.58	37.23	38.
36.5	73.9	14.73	17.8	66.5	13.25	16.95	61.75	9.95	11.75	47.05	7.65	42.5	6.83	31.1	4.4	23.3	3.35	20.93	3.05	15.1	2.16	15.53	2.61	14.4	2.39	10.35	1.69	53.28	37.7	38.45
37.	74.83	14.93	18.05	67.4	13.42	17.2	62.55	10.1	11.9	47.65	7.74	43.08	6.93	31.5	4.46	23.6	3.4	21.25	3.08	15.3	2.19	15.75	2.65	14.6	2.42	10.5	1.72	54.05	38.22	39.05
37.5	75.90	15.1	18.3	68.33	13.6	17.4	63.45	10.2	12.05	48.3	7.85	43.7	7.05	32.	4.52	23.9	3.45	21.5	3.11	15.5	2.22	15.95	2.68	14.78	2.46	10.6	1.75	54.75	38.75	39.55
38.	76.85	15.32	18.58	69.2	13.8	17.65	64.25	10.38	12.2	48.95	7.95	44.25	7.13	32.35	4.58	24.25	3.5	21.8	3.15	15.7	2.25	16.2	2.7	14.95	2.5	10.8	1.78	55.43	39.28	40.05
38.5	77.90	15.55	18.8	70.1	14.	17.88	65.15	10.5	12.38	49.58	8.05	44.8	7.23	32.8	4.62	24.55	3.53	22.05	3.19	15.9	2.28	16.4	2.73	15.15	2.54	10.95	1.81	56.15	39.8	40.6
39.	78.90	15.75	19.05	71.1	14.13	18.1	66.	10.65	12.53	50.25	8.13	45.4	7.3	33.28	4.7	24.85	3.58	22.33	3.23	16.15	2.31	16.6	2.76	15.35	2.58	11.05	1.84	56.93	40.3	41.1
39.5	79.95	15.95	19.3	72.05	14.3	18.34	66.8	10.75	12.7	50.9	8.23	45.98	7.4	33.7	4.75	25.15	3.6	22.65	3.27	16.35	2.33	16.8	2.8	15.55	2.62	11.2	1.87	57.65	40.8	41.6
40.	80.9	16.15	19.55	72.82	14.5	18.6	67.6	10.9	12.85	51.55	8.35	46.53	7.5	34.1	4.8	25.5	3.65	22.95	3.3	16.6	2.35	17.05	2.83	15.75	2.65	11.35	1.9	58.35	41.3	42.2
40.5	82.08	16.35	19.8	73.83	14.7	18.8	68.55	11.05	13.	52.2	8.45	47.15	7.6	34.5	4.88	25.8	3.7	23.24	3.35	16.8	2.38	17.23	2.87	15.95	2.68	11.5	1.92	59.1	41.85	42.7
41.	83.0	16.6	20.	74.6	14.87	19.05	69.31	11.15	13.15	52.8	8.55	47.63	7.7	35.	4.95	26.1	3.75	23.5	3.39	17.0	2.41	17.4	2.9	16.15	2.7	11.63	1.94	59.75	42.35	43.2
41.5	84.0	16.75	20.25	75.55	15.05	19.25	70.15	11.3	13.33	53.45	8.65	48.26	7.78	35.35	5.05	26.45	3.8	23.78	3.42	17.15	2.45	17.65	2.95	16.35	2.73	11.75	1.96	60.5	42.9	43.73
42.	84.84	16.96	20.5	76.35	15.27	19.5	71.0	11.45	13.5	54.18	8.74	48.76	7.86	35.76	5.1	26.77	3.83	24.09	3.46	17.39	2.48	17.85	2.99	16.52	2.75	11.92	1.98	61.08	43.33	44.23
42.5	85.90	17.15	20.75	77.4	15.41	19.75	71.85	11.6	13.65	54.78	8.85	49.4	7.95	36.22	5.13	27.1	3.88	24.38	3.5	17.6	2.5	17.99	3.03	16.75	2.79	12.08	2.0	62.	43.9	44.8
43.	87.0	17.35	21.	78.3	15.6	20.	72.7	11.75	13.8	55.4	8.95	49.98	8.1	36.65	5.19	27.42	3.91	24.7	3.55	17.8	2.52	18.29	3.07	16.95	2.83	12.2	2.02	62.7	44.5	45.3
43.5	88.0	17.55	21.25	79.2	15.75	20.2	73.45	11.88	14.	56.05	9.08	50.6	8.2	37.05	5.23	27.71	3.96	24.95	3.6	18.05	2.55	18.5	3.09	17.15	2.87	12.35	2.04	63.35	44.95	45.8
44.	89.0	17.75	21.5	80.08	15.95	20.4	74.55	12.05	14.15	56.65	9.18	51.1	8.28	37.45	5.29	28.05	4.	25.2	3.64	18.2	2.58	18.7	3.11	17.3	2.9	12.45	2.06	64.1	45.4	46.3
44.5	90.05	17.95	21.75	81.	16.1	20.64	75.25	12.05	14.3	57.3	9.28	51.76	8.35	37.9	5.32	28.35	4.05	25.5	3.68	18.4	2.62	18.9	3.14	17.5	2.94	12.6	2.08	64.88	46.	46.85
45.	91.05	18.1	22.	82.	16.3	20.9	76.1	12.35	14.45	57.98	9.4	52.35	8.45	38.3	5.4	28.65	4.1	25.8	3.72	18.6	2.66	19.1	3.18	17.7	2.99	12.73	2.1	65.6	46.45	47.4
45.5	92.05	18.3	22.25	82.85	16.5	21.1	77.	12.4	14.6	58.55	9.5	52.9	8.55	38.75	5.45	29.	4.15	26.05	3.76	18.82	2.7	19.3	3.21	17.9	3.04	12.86	2.13	66.3	47.	48.
46.	93.05	18.5	22.5	83.70	16.7	21.33	77.75	12.56	14.75	59.2	9.6	53.45	8.65	39.2	5.55	29.3	4.2	26.4	3.8	19.05	2.75	19.55	3.25	18.1	3.08	13.05	2.15	67.05	47.48	48.4

MERCHANT SHIPS; *2nd Example.*

Dimensions of Ship.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.								Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
Length	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.							
100	51.9	2.17	35.85	3.	22.63	.95	16.05	0.65	46.7	1.98	32.3	2.7	20.4	.88	14.5	0.55	32.3	1.4	22.3	1.9	14.35	0.6	10.35	0.47	35.85	27.2	8.96	17.9	31.2	32.3	1.4
101	52.4	2.2	36.2	3.03	22.85	.96	16.22	0.65	47.2	1.99	32.55	2.72	20.6	.89	14.65	0.55	32.55	1.41	22.55	1.92	14.5	0.6	10.45	0.47	36.2	27.5	9.05	18.05	31.5	32.55	1.41
102	52.9	2.22	36.55	3.06	23.05	.97	16.35	0.66	47.6	2.02	32.9	2.74	20.8	.89	14.8	0.56	32.9	1.42	22.74	1.94	14.6	0.61	10.55	0.47	36.55	27.75	9.12	18.23	31.8	32.9	1.42
103	53.45	2.26	36.9	3.09	23.3	.98	16.52	0.66	48.1	2.04	33.25	2.76	21.	.9	14.95	0.56	33.25	1.43	22.95	1.96	14.75	0.62	10.65	0.47	36.9	28.05	9.2	18.4	32.1	33.25	1.43
104	53.95	2.28	37.3	3.12	23.55	.99	16.7	0.67	48.6	2.06	33.55	2.79	21.2	.9	15.1	0.57	33.55	1.44	23.18	1.98	14.95	0.62	10.75	0.47	37.3	28.3	9.3	18.6	32.4	33.55	1.44
105	54.45	2.3	37.65	3.15	23.75	1.	16.85	0.67	49.05	2.08	33.9	2.82	21.4	.91	15.28	0.57	33.9	1.45	23.42	2.	15.05	0.62	10.85	0.48	37.65	28.6	9.4	18.8	32.73	33.9	1.45
106	55.	2.32	38.	3.18	24.05	1.01	17.05	0.68	49.5	2.1	34.2	2.85	21.6	.92	15.43	0.58	34.2	1.46	23.68	2.02	15.23	0.63	10.95	0.48	38.	28.89	9.5	18.98	33.	34.2	1.46
107	55.55	2.34	38.35	3.21	24.25	1.02	17.2	0.68	50.	2.12	34.5	2.88	21.8	.93	15.6	0.58	34.5	1.47	23.9	2.04	15.35	0.63	11.1	0.48	38.35	29.15	9.6	19.1	33.35	34.5	1.47
108	56.05	2.36	38.7	3.24	24.45	1.03	17.35	0.69	50.45	2.14	34.85	2.91	22.	.94	15.7	0.59	34.85	1.48	24.1	2.06	15.5	0.64	11.2	0.48	38.7	29.4	9.7	19.3	33.65	34.85	1.48
109	56.6	2.38	39.08	3.27	24.68	1.04	17.55	0.69	50.95	2.16	35.2	2.94	22.2	.95	15.85	0.59	35.2	1.49	24.3	2.08	15.65	0.64	11.3	0.48	39.08	29.7	9.8	19.5	34.	35.2	1.49
110	57.1	2.4	39.4	3.3	24.93	1.05	17.7	0.7	51.35	2.18	35.5	2.97	22.4	.96	16.	0.6	35.5	1.5	24.55	2.1	15.75	0.65	11.4	0.49	39.4	30.05	9.88	19.7	34.3	35.5	1.5
111	57.65	2.42	39.8	3.33	25.1	1.06	17.85	0.7	51.85	2.2	35.8	3.	22.6	.97	16.15	0.61	35.8	1.51	24.78	2.12	15.93	0.65	11.5	0.49	39.8	30.3	9.96	19.9	34.6	35.8	1.51
112	58.1	2.44	40.12	3.36	25.35	1.07	18.05	0.71	52.3	2.21	36.1	3.02	22.85	.98	16.3	0.61	36.1	1.52	24.98	2.14	16.08	0.66	11.6	0.49	40.12	30.55	10.05	20.05	34.9	36.1	1.52
113	58.6	2.46	40.5	3.39	25.6	1.08	18.2	0.71	52.76	2.23	36.4	3.04	23.05	.99	16.45	0.61	36.4	1.53	25.2	2.16	16.2	0.66	11.7	0.5	40.5	30.8	10.12	20.15	35.2	36.4	1.53
114	59.15	2.49	40.85	3.42	25.8	1.09	18.3	0.72	53.25	2.25	36.8	3.07	23.25	1.	16.6	0.62	36.8	1.54	25.4	2.18	16.35	0.67	11.8	0.5	40.85	31.05	10.23	20.4	35.5	36.8	1.54
115	59.65	2.50	41.2	3.45	26.05	1.1	18.45	0.72	53.55	2.27	37.1	3.1	23.45	1.01	16.75	0.62	37.1	1.55	25.65	2.20	16.45	0.67	11.9	0.5	41.2	31.3	10.3	20.6	35.8	37.1	1.55
116	60.25	2.52	41.6	3.48	26.25	1.12	18.65	0.73	54.15	2.29	37.4	3.13	23.65	1.01	16.9	0.63	37.4	1.57	25.88	2.21	16.65	0.68	12.	0.51	41.6	31.6	10.4	20.75	36.15	37.4	1.57
117	60.7	2.54	42.	3.51	26.5	1.13	18.8	0.73	54.6	2.31	37.75	3.16	23.85	1.02	17.05	0.63	37.75	1.59	26.1	2.22	16.78	0.68	12.1	0.51	42.	31.85	10.5	20.95	36.45	37.75	1.59
118	61.25	2.56	42.3	3.54	26.75	1.14	19.	0.74	55.1	2.33	38.1	3.19	24.1	1.02	17.2	0.64	38.1	1.63	26.3	2.24	16.93	0.69	12.2	0.51	42.3	32.1	10.6	21.1	36.75	38.1	1.63
119	61.7	2.58	42.68	3.57	27.	1.15	19.15	0.74	55.55	2.35	38.4	3.22	24.3	1.03	17.3	0.64	38.4	1.66	26.55	2.26	17.06	0.69	12.3	0.51	42.68	32.4	10.7	21.3	37.05	38.4	1.66
120	62.25	2.6	43.05	3.6	27.2	1.16	19.3	0.75	56.05	2.37	38.75	3.25	24.45	1.04	17.43	0.65	38.75	1.68	26.75	2.28	17.2	0.7	12.4	0.52	43.05	32.65	10.78	21.5	37.4	38.75	1.68
121	62.75	2.62	43.35	3.63	27.4	1.17	19.45	0.75	56.5	2.38	39.05	3.27	24.65	1.04	17.6	0.65	39.05	1.7	26.95	2.29	17.35	0.7	12.5	0.52	43.35	32.95	10.85	21.65	37.7	39.05	1.7
122	63.25	2.64	43.75	3.65	27.6	1.18	19.6	0.76	57.	2.39	39.35	3.3	24.85	1.05	17.73	0.66	39.35	1.71	27.15	2.3	17.4	0.7	12.6	0.52	43.75	33.2	10.95	21.8	38.	39.35	1.71
123	63.8	2.66	44.1	3.67	27.8	1.19	19.78	0.76	57.45	2.4	39.7	3.32	25.08	1.05	17.9	0.66	39.7	1.71	27.43	2.31	17.63	0.71	12.7	0.52	44.1	33.5	11.05	22.	38.3	39.7	1.71
124	64.3	2.68	44.44	3.7	28.05	1.19	19.92	0.77	57.85	2.42	40.	3.34	25.26	1.06	18.05	0.67	40.	1.72	27.6	2.32	17.75	0.71	12.8	0.53	44.44	33.75	11.1	22.15	38.6	40.	1.72

MERCHANT SHIPS; 2nd Example.—(Continued.)

Dimensions of Ship.	Main-yards.								Fore-yards								Mizen-yards.														
Length	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
125	64.85	2.70	44.8	3.73	28 3	1.2	20.1	0.77	58.35	2.44	40.3	3.36	25.48	1.06	18.15	0.68	40.3	1.72	27.85	2.33	17.93	0.71	12.9	0.53	44.8	34.05	11.2	22.3	38.9	40.3	1.72
126	65.4	2.72	45.2	3.76	28.5	1.21	20.2	0.78	58.8	2.46	40.65	3.38	25.66	1.07	18.28	0.68	40.65	1.73	28.05	2.34	18.08	0.72	13.	0.53	45.2	34.3	11.28	22.5	39.25	40.65	1.73
127	65.9	2.74	45.52	3.79	28.73	1.21	20.4	0.78	59.3	2.48	41.05	3.40	25.88	1.07	18.47	0.68	41.05	1.73	28.3	2.35	18.2	0.72	13.1	0.54	45.52	34.6	11.35	22.65	39.6	41.	1.74
128	66.4	2.76	45.88	3.82	28.95	1.22	20.55	0.79	59.7	2.49	41.3	3.43	26.1	1.08	18.55	0.69	41.3	1.74	28.5	2.37	18.33	0.72	13.2	0.54	45.88	34.85	11.45	22.85	39.9	41.3	1.75
129	66.95	2.78	46.25	3.85	29 2	1.23	20.73	0.79	60.3	2.50	41.6	3.46	26.3	1.08	18.78	0.69	41.6	1.74	28.73	2.39	18.49	0.72	13.3	0.54	46.25	35.15	11.53	23.05	40.2	41.6	1.76
130	67.5	2.81	46.6	3.88	29.5	1.24	29.	0.8	60.7	2.52	41.99	3.49	26.55	1.09	18.9	0.7	41.99	1.75	28.98	2.41	18.6	0.73	13.4	0.55	46.6	35.4	11.64	23.25	40.5	41.99	1.77
131	67.95	2.83	47.	3.91	29.68	1.25	21.15	0.81	61.1	2.54	42.3	3.51	26.7	1.1	19.05	0.7	42.3	1.77	29.2	2.42	18.78	0.73	13.5	0.55	47.	35.67	11.7	23.4	40.8	42.3	1.78
132	68.5	2.85	47.3	3.94	29.9	1.26	21.3	0.82	61.6	2.56	42.6	3.53	26.9	1.11	19.2	0.71	42.6	1.79	29 4	2.43	18.9	0.74	13.6	0.55	47.3	36.	11.8	23.55	40.1	42.6	1.79
133	68.98	2.87	47.66	3.97	30.2	1.27	21.45	0.83	62.1	2.58	43.	3.56	27.1	1.12	19.3	0.71	43.	1.81	29.6	2.44	19.05	0.74	13.7	0.56	47.66	36.23	11.9	23.75	40.43	43.	1.81
134	69.5	2.9	48.	4.	30.35	1.28	21.6	0.84	62.55	2 6	43.25	3.59	27.3	1.13	19.45	0.72	43.25	1.83	29.8	2.45	19.22	0.75	13.8	0.56	48.	36.48	12.	23.93	41.73	43.25	1.83
135	70.	2.93	48.38	4.03	30.6	1.29	21.75	0.85	63.	2.63	43.55	3.62	27.5	1.14	19.6	0.72	43.55	1.85	30.1	2.46	19.35	0.75	13.9	0.57	48.38	36.75	12.1	24.1	42.05	43.55	1.85
136	70. 53	2.95	48.75	4.06	30.85	1.3	21.9	0.86	63.45	2.66	43.85	3.65	27.7	1.15	19.75	0.73	43.85	1.87	30.3	2.47	19.5	0.76	14.	0.57	48.75	37.05	12.18	24.25	42.3	43.85	1.87
137	71.05	2.97	49.1	4.09	31.1	1.31	22.	0.87	63 95	2.69	44.2	3.67	27.9	1.16	19.9	0.73	44.2	1.89	30.55	2.49	19.65	0.77	14.1	0.58	49.1	37.3	12 25	24.45	42.7	44.2	1.89
138	71 6	3.	49.5	4.12	31.25	1.32	22.15	0.88	64.4	2.71	44.5	3.7	28.1	1.17	20.05	0.74	44.5	1.91	30.75	2.51	19.78	0.78	14.2	0.58	49.5	37.55	12.34	24.69	43.	44.5	1.91
139	72.1	3.02	49.85	4.15	31.45	1.33	22.3	0.89	64.9	2.73	44.8	3.72	28.3	1.19	20.2	0.74	44.8	1.93	30.95	2 53	19.92	0.79	14.3	0.59	49.85	37.85	12.43	24.85	43.3	44.8	1.93
140	72.6	3.04	50.2	4 18	31.7	1.35	22.5	0.9	65.35	2.75	45.1	3.75	28.55	1.2	20.35	0.75	45.1	1.95	31.2	2.55	20.1	0.8	14.4	0.59	50.2	38.1	12.55	25.	43.6	45.1	1.95
141	73.1	3.06	50.53	4.21	31.9	1.36	22.65	0.9	65.8	2.76	45.45	3.78	28.7	1.21	20.5	0.75	45.45	1.96	31.4	2.57	20.2	0.8	14.53	0.59	50.53	38.35	12.63	25.15	43 9	45.45	1.96
142	73.6	3.09	50.9	4.24	32.15	1.37	22.8	0.91	66.25	2.78	45.8	3.8	28.9	1.22	20.65	0.76	45.8	1 97	31.6	2.59	20.3	0.81	14.65	0.6	50.9	38.65	12.7	25.33	44.2	45.8	1.97
143	74.15	3.12	51.25	4.27	32.35	1.38	23.	0.91	66.7	2.8	46.1	3.82	29.15	1.22	20.8	0.76	46.1	1.98	31.85	2.61	20.5	0.81	14.77	0.6	51.25	39.9	12.8	25.52	44.5	46.1	1.98
144	74.7	3.15	51.6	4.3	32.6	1.39	23.13	0.92	67.2	2.82	46.45	3.84	29.35	1.23	20.95	0.77	46.45	1.99	32.05	2.63	20.65	0.82	14.88	0.6	51.6	39.2	12.9	25.7	44.8	46.45	1.99
145	75.2	3.17	51.95	4.33	32.8	1.40	23.3	0.92	67.65	2.84	46.78	3.87	29.55	1.23	21.05	0.77	46.78	2.	32 3	2.65	20.8	0.82	15	0.61	51.95	39.45	13.	25.9	45.1	46.78	2.
146	75.75	3.2	52.35	4.36	33.05	1.41	23 5	0.93	68.15	2.86	47.1	3.9	29.8	1.24	21.24	0.78	47.1	2.01	32.5	2.68	20.93	0.83	15.1	0.61	52.35	39.75	13.1	26.1	45.45	47 1	2.01
147	76.25	3.22	52.68	4.4	33.3	1.42	23.65	0 93	68.6	2.88	47.4	3.93	30.05	1.25	21.4	0.78	47.4	2.02	32.75	2.71	21.1	0.83	15.2	0.61	52.68	40.	13.18	26.25	45.75	47.4	2.02
148	76 78	3.24	53.	4.43	33.5	1.43	23.8	0.94	69.05	2.90	47.76	3.95	30.25	1.26	21.5	0.79	47.76	2.03	32.95	2.74	21.2	0.84	15.3	0.62	53.	40.26	13.26	26 4	46.1	47.76	2.03
149	77.3	3.26	53.43	4.45	33.7	1.44	23 95	0.94	69.55	2.91	48.08	3.98	30.4	1.27	21.65	0.79	48.08	2.04	33.2	2.77	21.33	0.84	15.4	0.62	53.43	40.55	13.33	26.6	46.4	48.08	2.04
150	77.8	3.28	53.75	4.48	33.95	1.45	24.1	0.95	70.	2.93	48.38	4.	30.6	1.28	21.8	0.8	48.38	2.05	33.4	2.8	21.45	0.85	15.5	0.62	53.75	40.8	13.4	26.8	46.7	48.38	2.05

MERCHANT SHIPS; *2nd Example.*

Dimensions of Ship.	LOWER-MASTS.									TOP-MASTS.						TOP-GALLANT-MASTS.						ROYAL-MASTS.			Bowsprit.	Jib-boom.	Flying-jib-boom.
	Main.			Fore.			Mizen.			Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.	Fore.	Mizen.			
Breadth.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Housed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Hounded	Headed.	Pole.	Pole.	Pole.			
26.5	51.85	10.35	16.75	46.70	9.4	15.7	43.6	7.05	15.35	32.15	5.2	28.9	4.7	20.3	2.9	16.35	2.35	14.7	2.1	10.1	1.57	10.35	9.3	6.4	35.2	25.1	27.15
27.	52.9	10.6	17.05	47.55	9.6	16.	44.2	7.15	15.6	32.75	5.3	29.4	4.8	20.65	2.95	16.65	2.4	14.95	2.15	10.25	1.6	10.6	9.5	6.52	35.88	25.55	27.65
27.5	53.8	10.77	17.38	48.5	9.75	16.3	45.1	7.3	15.95	33.4	5.4	30.1	4.9	21.05	3.	17.	2.45	15.25	2.2	10.45	1.62	10.77	9.68	6.65	36.6	26.1	28.2
28.	54.75	10.95	17.65	49.3	9.93	16.6	45.85	7.4	16.2	33.95	5.5	30.55	5.	21.4	3.05	17.2	2.5	15.5	2.24	10.62	1.64	10.95	9.8	6.78	37.2	26.5	28.65
28.5	55.6	11.15	18.	50.2	10.1	16.9	46.65	7.55	16.45	34.55	5.6	31.05	5.08	21.8	3.1	17.55	2.55	15.75	2.28	10.78	1.66	11.15	9.95	6.9	37.85	27.	29.2
29.	56.6	11.3	18.3	51.	10.25	17.15	47.35	7.68	16.75	35.1	5.7	31.55	5.1	22.1	3.15	17.8	2.58	16.05	2.31	11.	1.69	11.3	10.15	7.05	38.45	27.4	29.65
29.5	57.5	11.5	18.6	51.9	10.45	17.65	48.2	7.8	17.05	35.7	5.8	32.1	5.2	22.5	3.2	18.1	2.6	16.33	2.34	11.2	1.72	11.5	10.32	7.13	39.05	27.85	30.15
30.	58.6	11.7	18.9	52.7	10.6	17.7	49.	7.95	17.3	36.28	5.9	32.65	5.28	22.85	3.28	18.43	2.63	16.6	2.37	11.35	1.75	11.7	10.52	7.25	39.75	28.3	30.7
30.5	59.5	11.9	19.25	53.68	10.75	18.05	49.9	8.05	17.65	36.95	6.	33.25	5.35	23.3	3.32	18.78	2.68	16.87	2.4	11.55	1.77	11.9	10.7	7.4	40.5	28.85	30.23
31.	60.5	12.1	19.55	54.5	10.95	18.3	50.65	8.2	17.9	37.5	6.1	33.75	5.45	23.65	3.38	19.1	2.72	17.15	2.45	11.75	1.8	12.1	10.88	7.5	41.1	29.35	31.7
31.5	61.5	12.3	19.85	55.38	11.1	18.6	51.5	8.3	18.2	38.15	6.18	34.3	5.55	24.05	3.43	19.35	2.76	17.4	2.5	11.9	1.82	12.3	11.1	7.63	41.75	29.75	32.25
32.	62.4	12.5	20.2	56.25	11.25	18.9	52.31	8.44	18.5	38.75	6.25	34.87	5.63	24.42	3.48	19.69	2.81	17.72	2.53	12.1	1.85	12.5	11.3	7.75	42.4	30.28	32.8
32.5	63.4	12.7	20.5	57.1	11.45	19.25	53.1	8.6	18.78	39.3	6.35	35.4	5.73	24.8	3.56	20.05	2.86	17.95	2.56	12.3	1.87	12.7	11.4	7.85	43.05	30.75	33.25
33.	64.3	12.9	20.8	58.	11.65	19.5	53.9	8.7	19.05	39.9	6.45	35.9	5.8	25.15	3.6	20.25	2.9	18.25	2.6	12.5	1.9	12.9	11.55	8.	43.75	31.2	33.75
33.5	65.3	13.1	21.08	58.85	11.82	19.8	54.7	8.84	19.3	40.55	6.55	36.45	5.9	25.55	3.68	20.58	2.93	18.5	2.65	12.65	1.93	13.1	11.7	8.1	44.4	31.65	34.25
34.	66.45	13.3	21.45	59.75	12.05	20.1	55.35	8.98	19.65	41.1	6.65	37.05	6.	25.9	3.72	20.9	2.98	18.78	2.7	12.85	1.96	13.3	11.9	8.23	45.05	32.1	34.75
34.5	67.45	13.5	21.8	60.75	12.2	20.45	56.45	9.1	19.95	41.8	6.75	37.6	6.1	26.4	3.78	21.28	3.04	19.1	2.75	13.1	2.	13.5	12.1	8.35	45.8	32.7	35.25
35.	68.35	13.7	22.1	61.65	12.4	20.75	57.3	9.25	20.25	42.45	6.85	38.15	6.2	26.78	3.83	21.6	3.08	19.4	2.78	13.3	2.05	13.7	12.3	8.5	46.48	33.15	35.85
35.5	69.35	13.85	22.4	62.45	12.55	21.05	58.08	9.35	20.53	43.	6.95	38.65	6.3	27.1	3.9	21.86	3.11	19.65	2.83	13.45	2.08	13.85	12.45	8.6	47.1	33.6	36.35
36.	70.35	14.05	22.75	63.35	12.75	21.3	59.	9.5	20.8	43.6	7.05	39.25	6.38	27.5	3.95	22.15	3.15	19.95	2.86	13.65	2.11	14.05	12.65	8.7	47.8	34.05	36.85
36.5	71.35	14.25	23.05	64.25	12.9	21.65	59.7	9.65	21.1	44.2	7.15	39.8	6.45	27.9	4.05	22.5	3.2	20.2	2.9	13.85	2.14	14.25	12.8	8.85	48.4	34.55	37.35
37.	72.35	14.45	23.4	65.15	13.1	21.95	60.6	9.75	21.4	44.85	7.25	40.3	6.55	28.25	4.1	22.8	3.25	20.5	2.95	14.05	2.17	14.45	13.0	8.95	49.1	35.05	37.9
37.5	73.35	14.65	23.7	66.05	13.28	22.2	61.4	9.9	21.7	45.45	7.35	40.9	6.63	28.7	4.13	23.1	3.3	20.8	3.	14.25	2.2	14.65	13.18	9.1	49.85	35.5	38.45
38.	74.3	14.85	24.05	67.	13.42	22.5	62.2	10.05	22.	46.05	7.45	41.4	6.7	29.05	4.18	23.4	3.35	21.05	3.04	14.4	2.23	14.85	13.35	9.2	50.45	35.98	38.95
38.5	75.3	15.05	24.35	67.85	13.62	22.8	63.	10.2	22.3	46.7	7.55	41.95	6.8	29.45	4.22	23.75	3.4	21.35	3.08	14.65	2.26	15.05	13.5	9.3	51.2	36.45	39.45
39.	76.28	15.2	24.65	68.75	13.8	23.1	63.9	10.3	22.6	47.3	7.65	42.5	6.88	29.8	4.3	24.05	3.43	21.65	3.12	14.8	2.29	15.2	13.7	9.44	51.8	36.95	39.95
39.5	77.18	15.4	24.95	69.55	13.98	23.4	64.65	10.43	22.85	47.9	7.75	43.1	6.95	30.2	4.33	24.3	3.48	21.9	3.15	15.	2.32	15.4	13.9	9.58	52.45	37.4	40.5
40.	78.20	15.6	25.25	70.4	14.1	23.65	65.45	10.53	23.15	48.45	7.85	43.6	7.05	30.55	4.4	24.6	3.52	22.15	3.18	15.2	2.35	15.6	14.1	9.67	53.1	37.9	40.95

MERCHANT SHIPS, *3rd Example.*

Length.	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.														
	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm.	Top sail.	Arm.	Top gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Driver-boom.	Gaff.	Try-sail-gaff.	Main-try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
90	46.2	1.9	32.6	2.7	21.6	.8	16.7	.6	44.0	1.8	30.5	2.5	20.0	.8	15.0	.6	30.5	1.2	20.3	1.6	12.4	.5	8.4	.3	33.2	20.7	6.2	12.4	25.6	30.5	1.2
91	46.7	1.9	32.9	2.7	22.1	.9	16.9	.6	44.5	1.8	30.8	2.5	20.3	.8	15.1	.6	30.8	1.2	20.5	1.6	12.6	.5	8.5	.3	33.5	20.9	6.3	12.6	25.9	30.8	1.2
92	47.2	1.9	33.3	2.7	22.3	.9	17.1	.6	45.0	1.8	31.2	2.6	20.5	.8	15.2	.6	31.2	1.3	20.7	1.7	12.7	.5	8.6	.3	33.9	21.1	6.3	12.7	26.2	31.2	1.3
93	47.7	1.9	33.6	2.7	22.5	.9	17.3	.7	45.4	1.8	31.5	2.6	20.7	.8	15.4	.6	31.5	1.3	21.0	1.7	12.8	.5	8.7	.3	34.3	21.3	6.4	12.8	26.4	31.5	1.3
94	48.2	1.9	34.0	2.8	22.8	.9	17.5	.7	45.9	1.8	31.8	2.6	20.9	.8	15.6	.6	31.8	1.3	21.2	1.7	13.0	.5	8.8	.3	34.6	21.6	6.5	13.0	26.7	31.8	1.3
95	48.7	2.0	34.4	2.8	23.0	.9	17.6	.7	46.4	1.9	32.2	2.6	21.1	.8	15.8	.6	32.2	1.3	21.4	1.7	13.1	.5	8.9	.3	35.0	21.8	6.5	13.1	27.0	32.2	1.3
96	49.2	2.0	34.7	2.8	23.3	.9	17.8	.7	46.9	1.9	32.5	2.7	21.4	.8	15.9	.6	32.5	1.3	21.6	1.7	13.2	.5	9.0	.3	35.3	22.0	6.6	13.2	27.3	32.5	1.3
97	49.8	2.0	35.1	2.9	23.5	.9	18.0	.7	47.4	1.9	32.9	2.7	21.6	.8	16.1	.6	32.9	1.3	21.9	1.8	13.4	.5	9.1	.3	35.8	22.2	6.7	13.4	27.6	32.9	1.3
98	50.3	2.0	35.5	2.9	23.8	.9	18.2	.7	47.9	1.9	33.2	2.7	21.8	.8	16.3	.6	33.2	1.3	22.1	1.8	13.5	.5	9.2	.3	36.1	22.5	6.7	13.5	27.9	33.2	1.3
99	50.8	2.0	35.8	2.9	24.0	.9	18.4	.7	48.4	1.9	33.5	2.7	22.0	.9	16.4	.6	33.5	1.3	22.3	1.8	13.7	.5	9.3	.3	36.5	22.7	6.8	13.7	28.2	33.5	1.3
100	51.3	2.1	36.2	3.0	24.3	.9	18.6	.7	48.9	2.0	33.9	2.8	22.3	.9	16.6	.6	33.9	1.4	22.6	1.8	13.8	.5	9.4	.3	36.9	23.0	6.9	13.8	28.4	33.9	1.4
101	51.9	2.1	36.6	3.0	24.5	1.0	18.8	.7	49.4	2.0	34.2	2.8	22.5	.9	16.8	.6	34.2	1.4	22.8	1.8	13.9	.5	9.5	.3	37.2	23.2	6.9	13.9	28.7	34.2	1.4
102	52.4	2.1	36.9	3.0	24.7	1.0	19.0	.7	49.8	2.0	34.6	2.8	22.7	.9	16.9	.6	34.6	1.4	23.0	1.9	14.1	.5	9.6	.3	37.6	23.4	7.0	14.0	29.1	34.6	1.4
103	52.9	2.1	37.3	3.1	25.0	1.0	19.1	.7	50.3	2.0	34.9	2.8	22.9	.9	17.1	.6	34.9	1.4	23.2	1.9	14.2	.5	9.7	.3	37.9	23.6	7.1	14.2	29.3	34.9	1.4
104	53.4	2.2	37.6	3.1	25.2	1.0	19.3	.7	50.8	2.0	35.2	2.9	23.1	.9	17.2	.7	35.2	1.4	23.4	1.9	14.3	.5	9.7	.3	38.3	23.8	7.1	14.3	29.9	35.2	1.4
105	53.9	2.2	38.0	3.1	25.5	1.0	19.5	.7	51.3	2.1	35.6	2.9	23.4	.9	17.4	.7	35.6	1.4	23.6	1.9	14.4	.5	9.8	.3	38.7	24.1	7.2	14.4	30.2	35.6	1.4
106	54.4	2.2	38.3	3.2	25.7	1.0	19.7	.8	51.8	2.1	35.9	2.9	23.6	.9	17.6	.7	35.9	1.4	23.8	1.9	14.6	.5	9.9	.3	39.0	24.3	7.3	14.6	30.5	35.9	1.4
107	54.9	2.2	38.7	3.2	26.0	1.0	19.9	.8	52.3	2.1	36.2	3.0	23.8	.9	17.7	.7	36.2	1.4	24.0	1.9	14.7	.5	10.0	.4	39.4	24.5	7.3	14.7	30.7	36.2	1.4
108	55.5	2.2	39.1	3.2	26.2	1.0	20.0	.8	52.8	2.1	36.6	3.0	24.0	.9	17.9	.7	36.6	1.4	24.2	2.0	14.9	.5	10.1	.4	39.8	24.8	7.4	14.8	31.1	36.6	1.4
109	56.0	2.3	39.5	3.2	26.4	1.0	20.3	.8	53.3	2.1	36.9	3.0	24.3	.9	18.1	.7	36.9	1.4	24.4	2.0	15.0	.6	10.2	.4	40.1	25.0	7.5	15.0	31.3	36.9	1.4
110	56.5	2.3	39.8	3.3	26.7	1.0	20.5	.8	53.8	2.2	37.2	3.0	24.5	1.0	18.2	.7	37.2	1.5	24.6	2.0	15.2	.6	10.3	.4	40.5	25.2	7.6	15.2	31.6	37.2	1.5
111	57.0	2.3	40.2	3.3	26.9	1.1	20.6	.8	54.3	2.2	37.6	3.1	24.7	1.0	18.4	.7	37.6	1.5	24.8	2.0	15.3	.6	10.4	.4	40.9	25.5	7.6	15.3	31.9	37.6	1.5
112	57.5	2.3	40.5	3.3	27.2	1.1	20.8	.8	54.8	2.2	37.9	3.1	25.0	1.0	18.6	.7	37.9	1.5	25.0	2.0	15.4	.6	10.5	.4	41.3	25.7	7.7	15.4	32.2	37.9	1.5
113	58.1	2.3	40.9	3.3	27.4	1.1	21.0	.8	55.3	2.2	38.3	3.2	25.2	1.0	18.8	.7	38.3	1.5	25.3	2.0	15.6	.6	10.6	.4	41.7	25.9	7.8	15.6	32.5	38.3	1.5
114	58.5	2.4	41.3	3.4	27.7	1.1	21.2	.8	55.8	2.2	38.6	3.2	25.3	1.0	19.0	.7	38.6	1.5	25.5	2.1	15.7	.6	10.7	.4	42.0	26.1	7.8	15.7	32.8	38.6	1.5
116	59.1	2.4	41.6	3.4	27.9	1.1	21.4	.8	56.2	2.3	38.9	3.2	25.6	1.0	19.1	.7	38.9	1.5	25.7	2.1	15.8	.6	10.8	.4	42.4	26.4	7.9	15.8	33.1	38.9	1.5

MERCHANT SHIPS, *3rd Example* (*Continued.*)

	MAIN-YARDS.								FORE-YARDS.								MIZEN-YARDS.														
Length.	Lower.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Lower.	Arm	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Cross-jack.	Arm.	Top-sail.	Arm.	Top-gallant.	Arm.	Royal.	Arm.	Driver-boom.	Gaff.	Try-sail-gaff.	Main try-sail-gaff.	Swing-boom.	Sprit-sail-yard.	Arm.
116	59.6	2.4	42.0	3.4	28.1	1.1	21.6	.8	56.7	2.3	39.3	3.2	25.8	1.0	19.2	.7	39.3	1.5	25.9	2.1	16.0	.6	10.9	.4	42.8	26.6	8.0	16.0	33.4	39.3	1.5
117	60.1	2.4	42.4	3.4	28.4	1.1	21.7	.8	57.2	2.3	39.7	3.3	26.0	1.0	19.4	.7	39.7	1.5	26.2	2.1	16.2	.6	11.0	.4	43.1	26.9	8.1	16.2	33.6	39.7	1.5
118	60.6	2.4	42.7	3.5	28.6	1.1	21.9	.8	57.7	2.3	40.0	3.3	26.2	1.0	19.6	.8	40.0	1.5	26.4	2.1	16.3	.6	11.1	.4	43.5	27.1	8.1	16.3	33.9	40.0	1.5
119	61.1	2.5	43.1	3.5	28.9	1.1	22.1	.9	58.2	2.3	40.3	3.3	26.5	1.0	19.8	.8	40.3	1.6	26.6	2.2	16.4	.6	11.2	.4	43.9	27.3	8.2	16.4	34.2	40.3	1.6
120	61.6	2.5	43.5	3.5	29.1	1.1	22.3	.9	58.7	2.4	40.7	3.3	26.7	1.0	19.9	.8	40.7	1.6	26.8	2.2	16.6	.6	11.3	.4	44.2	27.6	8.3	16.6	34.5	40.7	1.6
121	62.2	2.5	43.8	3.6	29.4	1.2	22.5	.9	59.2	2.4	41.0	3.4	26.9	1.1	20.1	.8	41.0	1.6	27.1	2.2	16.7	.6	11.3	.4	44.6	27.8	8.3	16.7	34.8	41.0	1.6
122	62.7	2.5	44.2	3.6	29.6	1.2	22.7	.9	59.7	2.4	41.3	3.4	27.1	1.1	20.2	.8	41.3	1.6	27.5	2.2	16.8	.6	11.4	.4	45.0	28.0	8.4	16.8	35.1	41.3	1.6
123	63.2	2.5	44.5	3.6	29.8	1.2	22.8	.9	60.2	2.4	41.7	3.4	27.4	1.1	20.4	.8	41.7	1.6	27.7	2.2	17.0	.6	11.5	.4	45.3	28.2	8.5	17.0	35.4	41.7	1.6
124	63.7	2.6	44.9	3.7	30.1	1.2	23.1	.9	60.7	2.4	42.0	3.4	27.6	1.1	20.6	.8	42.0	1.6	27.9	2.3	17.1	.6	11.6	.4	45.7	28.4	8.5	17.1	35.7	42.0	1.6
125	64.2	2.6	45.2	3.7	30.3	1.2	23.2	.9	61.2	2.5	42.4	3.5	27.8	1.1	20.7	.8	42.4	1.6	28.2	2.3	17.2	.6	11.7	.4	46.0	28.7	8.6	17.2	36.0	42.4	1.6
126	64.8	2.6	45.6	3.7	30.6	1.2	23.4	.9	61.6	2.5	42.7	3.5	28.0	1.1	20.9	.8	42.7	1.6	28.4	2.3	17.4	.6	11.8	.4	46.4	28.9	8.7	17.4	36.2	42.7	1.6
127	65.3	2.6	46.0	3.8	30.8	1.2	23.6	.9	62.1	2.5	43.1	3.5	28.2	1.1	21.1	.8	43.1	1.6	28.6	2.3	17.5	.6	11.9	.4	46.8	29.1	8.8	17.6	36.5	43.1	1.6
128	65.8	2.7	46.3	3.8	31.1	1.2	23.8	.9	62.6	2.5	43.4	3.5	28.5	1.1	21.2	.8	43.4	1.7	28.9	2.3	17.7	.6	12.0	.4	47.1	29.4	8.8	17.7	36.8	43.4	1.7
129	66.3	2.7	46.7	3.8	31.3	1.2	24.0	.9	63.1	2.5	43.8	3.6	28.7	1.1	21.4	.8	43.8	1.7	29.1	2.4	17.8	.6	12.1	.4	47.5	29.6	8.9	17.8	37.1	43.8	1.7
130	66.8	2.7	47.1	3.9	31.5	1.2	24.2	.9	63.6	2.6	44.1	3.6	28.9	1.1	21.6	.8	44.1	1.7	29.3	2.4	17.9	.7	12.2	.5	47.9	29.8	9.0	18.0	37.4	44.1	1.7
131	67.3	2.7	47.4	3.9	31.8	1.3	24.4	.9	64.1	2.6	44.4	3.6	29.1	1.1	21.7	.8	44.4	1.7	29.5	2.4	18.1	.7	12.3	.5	48.3	30.0	9.0	18.1	37.7	44.4	1.7
132	67.8	2.7	47.8	3.9	32.0	1.3	24.6	1.0	64.6	2.6	44.8	3.7	29.3	1.2	21.9	.8	44.8	1.7	29.8	2.4	18.2	.7	12.4	.5	48.6	30.3	9.1	18.2	38.0	44.8	1.7
133	68.4	2.8	48.2	4.0	32.3	1.3	24.8	1.0	65.1	2.6	45.1	3.7	29.6	1.2	22.1	.9	45.1	1.7	30.0	2.4	18.4	.7	12.5	.5	49.0	30.6	9.2	18.4	38.3	45.1	1.7
134	68.9	2.8	48.5	4.0	32.6	1.3	25.0	1.0	65.6	2.6	45.4	3.7	29.8	1.2	22.2	.9	45.4	1.7	30.3	2.5	18.5	.7	12.6	.5	49.4	30.8	9.2	18.5	38.6	45.4	1.7
135	69.4	2.8	48.9	4.0	32.8	1.3	25.1	1.0	66.1	2.7	45.8	3.7	30.0	1.2	22.4	.9	45.8	1.7	30.5	2.5	18.6	.7	12.7	.5	49.7	31.0	9.3	18.6	38.9	45.8	1.7
136	70.0	2.8	49.2	4.0	33.0	1.3	25.3	1.0	66.6	2.7	46.1	3.8	30.2	1.2	22.6	.9	46.1	1.8	30.7	2.5	18.8	.7	12.8	.5	50.1	31.2	9.4	18.8	39.1	46.1	1.8
137	70.5	2.8	49.6	4.1	33.3	1.3	25.5	1.0	67.0	2.7	46.4	3.8	30.5	1.2	22.8	.9	46.4	1.8	30.9	2.5	18.9	.7	12.9	.5	50.5	31.5	9.5	19.0	39.4	46.4	1.8
138	71.0	2.9	50.0	4.1	33.6	1.3	25.7	1.0	67.5	2.7	46.8	3.8	30.7	1.2	23.0	.9	46.8	1.8	31.2	2.5	19.1	.7	13.0	.5	50.9	31.7	9.5	19.1	39.7	46.8	1.8
139	71.5	2.9	50.4	4.1	33.8	1.3	25.9	1.0	68.0	2.7	47.1	3.9	30.9	1.2	23.1	.9	47.1	1.8	31.4	2.6	19.2	.7	13.1	.5	51.3	31.9	9.6	19.2	40.0	47.1	1.8
140	72.0	2.9	50.7	4.2	34.0	1.4	26.1	1.0	68.5	2.8	47.5	3.9	31.1	1.2	23.2	.9	47.5	1.8	31.6	2.6	19.3	.7	13.2	.5	51.7	32.2	9.7	19.4	40.3	47.5	1.8

MERCHANT SHIPS, *3rd Example*—(*Continued.*)

Dimensions of Ship.	LOWER-MASTS.						TOP-MASTS.						TOP-GALLANT-MASTS.					
	Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen.	
Breadth.	Hounded.	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Headed.	Hounded	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded.	Headed.	Hounded	Headed.
24.	46.65	9.25	43.55	8.65	39.25	6.4	28.35	4.52	27.8	4.45	20.8	3.0	13.45	1.9	13.33	1.8	10.78	1.5
24.5	47.7	9.45	44.55	8.8	40.15	6.55	29.0	4.65	28.4	4.52	21.28	3.05	13.75	1.95	13.61	1.9	11.0	1.55
25.	48.5	9.65	45.35	9.0	40.90	6.65	29.50	4.71	29.0	4.65	21.65	3.1	14.0	1.98	13.89	1.92	11.2	1.6
25.5	49.57	9.85	46.25	9.25	41.75	6.8	30.10	4.80	29.5	4.70	22.05	3.12	14.3	2.0	14.15	1.97	11.48	1.62
26.	50.55	10.05	47.15	9.35	42.55	6.95	30.7	4.90	30.2	4.8	22.55	3.18	14.6	2.05	14.45	2.0	11.7	1.65
26.5	51.5	10.25	48.1	9.5	43.45	7.05	31.25	5.0	30.78	4.90	23.0	3.23	14.9	2.1	14.70	2.05	11.9	1.7
27.	52.5	10.45	49.0	9.7	44.25	7.2	31.9	5.1	31.35	5.0	23.4	3.3	15.2	2.15	15.0	2.1	12.1	1.73
27.5	53.5	10.65	49.9	9.9	45.05	7.35	32.45	5.2	31.9	5.1	23.85	3.35	15.45	2.2	15.28	2.12	12.35	1.75
28.	54.45	10.85	50.75	10.05	45.85	7.5	33.0	5.3	32.45	5.2	24.25	3.40	15.7	2.25	15.51	2.18	12.55	1.78
28.5	55.45	11.05	51.70	10.25	46.65	7.65	33.65	5.4	33.0	5.3	24.7	3.48	16.0	2.3	15.8	2.2	12.78	1.8
29.	56.4	11.25	52.60	10.43	47.45	7.75	34.2	5.5	33.65	5.38	25.1	3.55	16.28	2.33	16.1	2.24	13.0	1.83
29.5	57.4	11.4	53.50	10.6	48.25	7.88	34.8	5.58	34.25	5.45	25.58	3.61	16.52	2.38	16.4	2.28	13.2	1.86
30.	58.3	11.6	54.4	10.8	49.05	8.0	35.4	5.65	34.8	5.53	26.0	3.7	16.8	2.40	16.7	2.31	13.4	1.9
30.5	59.3	11.8	55.3	10.98	49.9	8.15	36.0	5.74	35.37	5.65	26.4	3.75	17.1	2.45	16.92	2.37	13.68	1.95
31.	60.3	12.0	56.25	11.15	50.75	8.28	36.6	5.82	35.95	5.75	26.85	3.8	17.35	2.48	17.2	2.4	13.9	2.0
31.5	61.25	12.18	57.2	11.3	51.6	8.4	37.20	5.95	36.53	5.83	27.28	3.85	17.65	2.52	17.45	2.45	14.1	2.02
32.	62.25	12.4	58.1	11.5	52.5	8.55	37.8	6.05	37.2	5.98	27.76	3.9	17.95	2.56	17.8	2.48	14.4	2.05
32.5	63.25	12.58	59.0	11.7	53.25	8.7	38.4	6.15	37.7	6.05	28.2	3.95	18.25	2.6	18.05	2.5	14.6	2.08
33.	64.25	12.8	60.	11.9	54.15	8.85	39.0	6.25	38.4	6.18	28.7	4.0	18.53	2.65	18.3	2.55	14.8	2.11
33.5	65.2	12.98	60.9	12.05	55.0	9.0	39.6	6.35	38.9	6.25	29.01	4.1	18.8	2.7	18.6	2.6	15.0	2.15
34.	66.2	13.1	61.8	12.28	55.75	9.1	40.2	6.45	39.55	6.35	29.55	4.2	19.1	2.75	18.9	2.65	15.25	2.18
34.5	67.15	13.35	62.7	12.45	56.6	9.25	40.75	6.55	40.05	6.43	29.95	4.3	19.4	2.78	19.2	2.7	15.5	2.2
35.	68.15	13.55	63.6	12.63	57.4	9.4	41.35	6.65	40.65	6.55	30.38	4.38	19.7	2.82	19.5	2.75	15.75	2.25
35.5	69.15	13.75	64.5	12.8	58.25	9.5	41.95	6.75	41.25	6.68	30.85	4.4	20.0	2.88	19.8	2.8	15.95	2.3
36.	70.1	13.95	65.4	13.05	59.0	9.65	42.55	6.85	41.85	6.75	31.28	4.45	20.3	2.9	20.05	2.83	16.2	2.33
36.5	71.05	14.15	66.3	13.25	59.8	9.78	43.1	6.95	42.4	6.83	31.05	4.55	20.55	2.93	20.25	2.88	16.4	2.35
37.	72.05	14.35	67.2	13.35	60.7	9.9	43.7	7.05	43.05	6.95	32.08	4.6	20.8	2.96	20.58	2.90	16.6	2.38
37.5	73.05	14.52	68.15	13.5	61.45	10.05	44.3	7.12	43.55	7.0	32.52	4.65	21.05	3.0	20.85	2.93	16.8	2.4
38.	74.	14.75	69.05	13.7	62.28	10.2	44.9	7.2	44.15	7.08	33.0	4.7	21.35	3.04	21.1	2.98	17.0	2.45
38.5	75.	14.9	70.0	13.9	63.15	10.35	45.5	7.3	44.75	7.18	33.4	4.78	21.6	3.08	21.4	3.0	17.25	2.48
39.	75.95	15.05	70.9	14.05	63.98	10.45	46.05	7.4	45.25	7.3	33.8	4.83	21.9	3.1	21.7	3.03	17.5	2.51
39.5	76.85	15.3	71.8	14.25	64.75	10.6	46.65	7.5	45.85	7.4	34.29	4.9	22.1	3.2	22.0	3.1	17.7	2.54
40.	77.80	15.48	72.65	14.4	65.6	10.7	47.2	7.58	46.45	7.45	34.7	4.96	22.45	3.25	22.2	3.12	17.95	2.59

ON THE

DIAMETERS AND FORMS OF MASTS, YARDS, &c.

GENERAL OBSERVATIONS.

In determining what strength and form should be given to the different spars, of which the masts of vessels are made, so that a due support may be afforded for resisting the efforts that tend to break or upset them, we must be guided by our observations on the effects produced on the different descriptions of spars, and by what experience and long usage have determined to be the best, rather than by any abstract theory.

The difficulty of obtaining correct data respecting the stresses to which masts, yards, &c., are subject, in every situation, and at the same time including the different supports that they receive under all circumstances, renders any analytical reasoning of little use. For though the conclusions which Bouguer and other writers have formed are ingenious, and founded on the strictest reasoning; yet, on account of their having neglected to take into consideration some particular stress, action, or support, they have been found to be of little use in practice.

The diameter and form, as at present established, appear to have been determined from the experience of the mast-maker; who, in order to lessen the expense, and diminish the weight, might at first have been induced to give the masts, yards, &c., very small diameters; but afterwards, according as he may have found them weak, wrung, twisted, or ruptured, to increase their diameters, and consequently their strength, till they became of that form and size which he considers to be best. It is from a knowledge of the limits which experience has marked out, that we are able to form such a judgment respecting the strength and diameters that are necessary for all masts, yards, &c., as cannot be far from being correct.

In giving to masts made of different woods the same diameters, independently of their relative strength, there may appear to be a want of system; but in thus varying, as little as possible, the diameters of masts, &c., for the same class of ships, a considerable advantage is obtained, inasmuch as the sticks of different woods supply the place of each other in case of accident, &c.: the diameters being sufficiently large for the weakest timber that ought to be used for masts.

On the greatest Diameter.

The largest diameter is that which is given, and is commonly called the given diameter. In *standing masts*, it is at the partners or decks; in masts of three-deck ships, and yachts that have a middle deck, the given diameter is at the middle deck; and in all other ships, at the upper or highest wedging deck.

In *top-masts, and top-gallant-masts*, the given diameter is at the caps, or at the heads of the masts below, to which they are affixed. In *bowsprits*, it is at the bed; except in those of cutters, where it is generally one-third from the inner end. In *yards*, it is at the slings or middle; in *booms*, and *jib-booms*, at the bowsprit-cap; in *driver or main-booms*, at one-third from the after end, or at the taffrail or sheet; in *studding-sail booms, top and top-gallant*, at one-third from each end between which they are parallel, and in *swing or lower studding-sail-booms*, at one-third from the inner end.

BOATS.

Diameters of Masts, Booms, &c.

Length of Masts.	OF MASTS.						OF BOOMS, GAFFS, YARDS, BOWSPRITS, OUTRIGGERS, AND SLIDES, OR TOP-MASTS, TO SLIDING-GUNTER-MASTS AND SPRITS.														
							Schooner-rigged.			Lugger.			Sprit-sail.			Sliding-gunter.			Lateen-rigged.		
	Schooner rigged.	Lugger rigged.	Sprit-sail rigged.	Sliding-gunter rigged.	Lateen rigged.	Mizen-mast.	Boom.	Gaff.	Bowsprit.	Yards.	Bowsprit.	Outrigger.	Bowsprit.	Outrigger.	Sprits.	Bowsprit.	Outrigger.	Slides.	Boomkin.	Outrigger.	Yards.
one inch to	4.5	4.4	4.4	4.0	3.6	3.4	5.5	3.2	2.5	5.0	2.5	3.0	2.5	3.0	9.0	2.5	3.0	5.4	2.4	3.0	5.0
feet.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
43	9½	9¾	9¾	10¾	12										4¾	12					8⅝
42	9⅜	9½	9½	10½	11⅝										4⅝	11⅝					8⅜
41	9⅛	9⅜	9⅜	10¼	11⅜										4½	11¼					8¼
40	8⅞	9	9	10	11⅛										4½	10¾					8
39	8⅝	8⅞	8⅞	9¾	10⅞										4⅜	10⅜					7¾
38	8½	8⅝	8⅝	9½	10½										4¼						7⅝
37	8¼	8⅜	8⅜	9¼	10¼										4⅛						7⅜
36	8	8⅛	8⅛	9	10										4						7¼
35	7¾	8	8	8¾	9¾										3⅞						7
34	7½	7¾	7¾	8½	9½										3¾						6¾
33	7⅜	7½	7½	8¼	9⅛										3⅝						6⅝
32	7⅛	7¼	7¼	8	8⅞										3½						6⅜
31	6⅞	7	7	7¾	8⅝										3⅜						6¼
30	6⅝	6⅞	6⅞	7½	8⅜	8⅞	5½	9⅜	12	6	12	10	12	10	3⅜	12	10	5½	12½	10	6
29	6⅜	6⅝	6⅝	7¼	8	8½	5¼	9	11⅝	5¾	11⅝	9⅝	11⅝	9⅝	3¼	11⅝	9⅝	5⅜	12⅛	9⅝	5¾
28	6¼	6⅜	6⅜	7	7¾	8¼	5⅛	8¾	11¼	5⅝	11¼	9⅜	11¼	9⅜	3⅛	11¼	9⅜	5⅛	11⅝	9⅜	5⅝
27	6	6⅛	6⅛	6¾	7½	8	4⅞	8⅜	10¾	5⅜	10¾	9	10¾	9	3	10¾	9	5	11¼	9	5⅜
26	5¾	5⅞	5⅞	6½	7¼	7⅝	4¾	8⅛	10⅜	5¼	10⅜	8⅝	10⅜	8⅝	2⅞	10⅜	8⅝	4⅞	10⅞	8⅝	5¼
25	5½	5⅝	5⅝	6¼	7	7⅜	4½	7¾	10	5	10	8⅜	10	8⅜	2¾	10	8⅜	4⅝	10⅜	8⅜	5
24	5⅜	5½	5½	6	6⅝	7	4⅜	7½	9⅝	4¾	9⅝	8	9⅝	8	2⅝	9⅝	8	4½	10	8	4¾
23	5⅛	5¼	5¼	5¾	6⅜	6¾	4⅛	7⅛	9¼	4⅝	9¼	7⅝	9¼	7⅝	2½	9¼	7⅝	4¼	9⅝	7⅝	4⅝
22	5	5	5	5½	6⅛	6½	4	6⅞	8¾	4⅜	8¾	7⅜	8¾	7⅜	2½	8¾	7⅜	4⅛	9⅛	7⅜	4⅜
21	4⅞	4⅞	4⅞	5¼	5⅞	6⅛	3⅞	6½	8⅜	4¼	8⅜	7	8⅜	7	2⅜	8⅜	7	3⅞	8¾	7	4¼
20	4¾	4¾	4¾	5	5½	5⅞	3⅝	6¼	8	4	8	6⅝	8	6⅝	2¼	8	6⅝	3¾	8⅜	6⅝	4
19	4⅝	4⅝	4⅝	4¾	5¼	5⅝	3½	5⅞	7⅝	3¾	7⅝	6⅜	7⅝	6⅜	2⅛	7⅝	6⅜	3½	7⅞	6⅜	3⅞
18	4½	4½	4½	4½	5	5¼	3¼	5⅝	7¼	3⅝	7¼	6	7¼	6	2	7¼	6	3⅜	7½	6	3¾
17	4¼	4¼	4¼	4¼	4¾	5	3⅛	5⅜	6¾	3⅜	6¾	5⅝	6¾	5⅝	2	6¾	5⅝	3⅛	7⅛	5⅝	3⅝
16	4	4	4	4	4½	4¾	2⅞	5	6⅜	3¼	6⅜	5⅜	6⅜	5⅜	1⅞	6⅜	5⅜	3	6⅝	5⅜	3⅜
15	3¾	3¾	3¾	3¾	4⅛	4⅜	2¾	4⅝	6	3	6	5	6	5	1⅞	6	5	2¾	6¼	5	3¼
14	3½	3½	3½	3½	3⅞	4⅛	2⅝	4⅜	5⅝	2¾	5⅝	4⅝	5⅝	4⅝	1¾	5⅝	4⅝	2⅝	5⅞	4⅝	3
13	3¼	3¼	3¼	3¼	3⅝	3⅞	2½	4	5¼	2⅝	5¼	4⅜	5¼	4⅜	1¾	5¼	4⅜	2⅜	5⅜	4⅜	2⅞
12	3	3	3	3	3⅜	3½	2⅜	3¾	4¾	2⅜	4¾	4	4¾	4	1⅝	4¾	4	2¼	5	4	2⅝
11	2¾	2¾	2¾	2¾	3	3¼	2¼	3⅜	4⅜	2¼	4⅜	3⅝	4⅜	3⅝	1⅝	4⅜	3⅝	2⅛	4⅝	3⅝	2½
10	2½	2½	2½	2½	2¾	3	2⅛	3⅛	4	2⅛	4	3⅜	4	3⅜	1½	4	3⅜	2	4⅛	3⅜	
9							2	2⅞	3⅝	2⅛	3⅝	3	3⅝	3	1½	3⅝	3	2	3¾	3	
8							1⅞	2½	3¼	2	3¼	2⅝	3¼	2⅝		3¼	2¾	1⅞	3⅜	2¾	
7							1⅞	2⅛	2¾	2	2¾	2⅜	2¾	2⅜		2¾	2⅝	1⅞	2⅞	2⅝	
6							1¾	2	2⅜	1⅞	2⅜	2	2⅜	2		2⅜	2⅜	1¾	2½	2⅜	
5											2	1⅝	2			2			2⅛		
4																			1⅝		
3																			1¼		
2																			⅞		

LUGGER AND LATEEN RIGGED.—*Diameter of Masts, Booms, &c.*

MASTS.																	BOWSPRITS, YARDS, AND BOOMS.					
Length of Masts &c.		Lugger.				Chasse Marée.			Xebec.			Galley.			Top-masts.		Lugger.					
																	Bowsprit.		Outrigger.		Boom.	
Hounded Length.	Whole length	Diameter.	Hounded length.	Whole length of Mast.	Diameter.	Hounded length.	Whole length.	Diameter.	Hounded length.	Whole length.	Diameter.	Hounded length.	Whole length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
20	22.0	4¾	76	83.6	18¼	20	21.5	4¾	20	22.5	5¾	20	21.2	7⅜	20	5⅝	20	6	20	5	20	4
21	23.1	5	77	84.7	18½	21	22.5	5	21	23.6	6⅛	21	22.2	7¾	21	5⅞	21	6⅜	21	5¼	21	4¼
22	24.2	5¼	78	85.8	18¾	22	23.6	5¼	22	24.7	6⅜	22	23.3	8⅛	22	6¼	22	6⅝	22	5½	22	4⅜
23	25.3	5½	79	86.9	19	23	24.7	5½	23	25.8	6¾	23	24.38	8½	23	6½	23	6⅞	23	5¾	23	4⅝
24	26.4	5¾	80	88.0	19¼	24	25.8	5¾	24	27.	7	24	25.4	8⅞	24	6¾	24	7¼	24	6	24	4¾
25	27.5	6	81	89.1	19⅜	25	26.9	6	25	28.1	7¼	25	26.5	9¼	25	7	25	7½	25	6¼	25	5
26	28.6	6¼	82	90.2	19⅝	26	27.9	6¼	26	29.2	7½	26	27.5	9⅝	26	7¼	26	7¾	26	6½	26	5¼
27	29.7	6½	83	91.3	19⅞	27	29.	6½	27	30.3	7¾	27	28.6	10	27	7⅝	27	8⅛	27	6¾	27	5⅜
28	30.8	6¾	84	92.4	20⅛	28	30.12	6¾	28	31.5	8⅛	28	29.6	10⅜	28	7¾	28	8⅜	28	7	28	5⅝
29	31.9	7	85	93.5	20⅜	29	31.2	7	29	32.6	8⅜	29	30.7	10¾	29	8⅛	29	8¾	29	7¼	29	5¾
30	33.0	7¼				30	32.2	7¼	30	33.7	8¾	30	31.8	11⅛	30	8⅜	30	9	30	7½	30	6
31	34.1	7⅜				31	33.3	7⅜	31	34.8	9	31	32.8	11½	31	8¾	31	9¼	31	7¾	31	6¼
32	35.2	7¾				32	34.4	7¾	32	36.	9¼	32	33.9	11¾	32	9	32	9⅝	32	8	32	6⅜
33	36.3	7⅞				33	35.5	7⅞	33	37.1	9⅝	33	34.9	12¼	33	9¼	33	9⅞	33	8¼	33	6⅝
34	37.4	8⅛				34	36.5	8¼	34	38.2	9⅞	34	36.0	12⅝	34	9½	34	10¼	34	8½	34	6¾
35	38.5	8⅜				35	37.6	8⅜	35	39.3	10⅛	35	37.1	12⅞	35	9¾	35	10½	35	8¾	35	7
36	39.6	8⅝				36	38.7	8⅝	36	40.5	10⅜	36	38.1	13¼	36	10⅛	36	10¾	36	9	36	7¼
37	40.7	8⅞				37	39.8	8⅞	37	41.6	10¾	37	39.2	13¾	37	10⅜	37	11⅛	37	9¼	37	7⅜
38	41.8	9⅛				38	40.8	9⅛	38	42.7	11	38	40.2	14⅛	38	10⅝	38	11⅜	38	9½	38	7⅝
39	42.9	9⅜				39	41.9	9⅜	39	43.8	11¼	39	41.3	14½	39	10⅞	39	11¾	39	9¾	39	7¾
40	44.0	9⅝				40	43.0	9⅝	40	44.9	11⅝	40	42.4	14¾	40	11¼	40	12	40	10	40	8
41	45.1	9¾				41	44.1	9¾	41	46.1	11⅞	41	43.4	15¼	41	11½	41	12¼	41	10¼	41	8¼
42	46.2	10⅛				42	45.1	10⅛	42	47.2	12¼	42	44.5	15½	42	11¾	42	12⅝	42	10½	42	8⅜
43	47.3	10¼				43	46.2	10¼	43	48.3	12½	43	45.5	15⅞	43	12	43	12⅞	43	10¾	43	8⅝
44	48.4	10⅝				44	47.3	10⅝	44	49.5	12¾	44	46.6	16¼	44	12¼	44	13¼	44	11	44	8¾
45	49.5	10¾				45	48.4	10¾	45	50.6	13	45	47.7	16⅝	45	12⅝	45	13½	45	11¼	45	9
46	50.6	11				46	49.4	11	46	51.7	13¼	46	48.7	17			46	13¾	46	11½	46	9¼
47	51.7	11¼				47	50.5	11¼	47	52.8	13⅝	47	49.8	17⅜			47	14⅛	47	11¾	47	9⅜
48	52.8	11½				48	51.6	11½	48	54.0	13⅞	48	50.8	17¾			48	14⅜	48	12	48	9⅝
49	53.9	11¾				49	52.7	11¾	49	55.1	14¼	49	51.9	18⅛			49	14¾	49	12¼	49	9¾
50	55.0	12				50	53.8	12	50	56.2	14½	50	53.0	18½			50	15	50	12½	50	10
51	56.1	12¼				51	54.8	12¼	51	57.3	14¾	51	54.0	18⅞			51	15¼	51	12¾	51	10¼
52	57.2	12½				52	55.9	12½	52	58.5	15⅛	52	55.1	19¼			52	15⅝	52	13	52	10⅜
53	58.3	12¾				53	57.0	12¾	53	59.6	15⅜	53	56.2	19⅝			53	15⅞	53	13¼	53	10⅝
54	59.4	13				54	58.1	13	54	60.7	15¾	54	57.2	20			54	16¼	54	13½	54	10¾
55	60.5	13¼				55	59.1	13¼	55	61.8	15⅞	55	58.3	20⅜			55	16½	55	13¾	55	11
56	61.6	13⅜				56	60.2	13⅜	56	63.0	16¼	56	59.3	20¾			56	16¾	56	14	56	11¼
57	62.7	13⅝				57	61.3	13⅝	57	64.1	16½	57	60.4	21⅛			57	17⅛	57	14¼	57	11⅜
58	63.8	13⅞				58	62.4	13⅞	58	65.2	16¾	58	61.4	21½			58	17⅜	58	14½	58	11⅝
59	64.9	14¼				59	63.4	14¼	59	66.3	17⅛	59	62.5	21⅞			59	17¾	59	14¾	59	11¾
60	66.0	14⅜				60	64.5	14⅜	60	67.5	17⅜	60	63.6	22¼			60	18	60	15	60	12
61	67.1	14⅝				61	65.6	14⅝	61	68.6	17¾						61	18¼	61	15¼	61	12¼
62	68.2	14⅞				62	66.7	14⅞	62	69.7	18						62	18⅝	62	15½	62	12⅜
63	69.3	15⅛				63	67.8	15⅛	63	70.8	18¼						63	18⅞	63	15¾	63	12⅝
64	70.4	15⅜				64	68 8	15⅜	64	72.0	18⅝						64	19¼	64	16	64	12¾
65	71.5	15⅝				65	69.9	15⅝	65	73.1	18¾						65	19½	65	16¼	65	13
66	72.6	15¾				66	71.01	15¾	66	74.2	19⅛						66	19¾	66	16½	66	13¼
67	73.7	16⅛				67	72.	16⅛	67	75.3	19⅜						67	23⅛	67	16¾	67	13⅜
68	74.8	16¼				68	73.1	16¼	68	76 5	19¾						68	20⅜	68	17	68	13⅝
69	75.9	16⅝				69	74.2	16⅝	69	77.6	20						69	20½	69	17¼	69	13¾
70	77 0	16¾				70	75.3	16¾	70	78.7	20¼						70	21	70	17½	70	14
71	78.1	17							71	79.8	20⅝											
72	79.2	17¼							72	81.0	20⅞											
73	80.3	17½							73	82.1	21											
74	81.4	17¾							74	83.2	21½											
75	82.5	18							75	84.3	21¾											

LUGGER AND LATEEN RIGGED.—*Diameters of Yards.*

YARDS.															
Lugger First.		Lugger Second.		Lugger Top-sail.		Chasse Maree.				Xebec.				Galley.	
Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
19	4¼	17	3⅞	20	4	31	3¾	87	10⅝	31	3¾	87	10⅜	20	3
20	4½	18	4⅛	21	4¼	32	3⅞	88	10¾	32	3¾	88	10⅝	21	3⅛
21	4⅝	19	4⅜	22	4⅜	33	4	89	10⅞	33	3⅞	89	10¾	22	3¼
22	4¾	20	4⅝	23	4⅝	34	4⅛	90	11	34	4⅛	90	10¾	23	3⅜
23	5⅛	21	4¾	24	4¾	35	4¼	91	11⅛	35	4¼	91	10⅞	24	3⅝
24	5¼	22	5⅛	25	5	36	4⅜	92	11¼	36	4¼	92	11	25	3¾
25	5½	23	5¼	26	5¼	37	4½	93	11¼	37	4⅜	93	11¼	26	3⅞
26	5¾	24	5½	27	5⅜	38	4⅝	94	11½	38	4½	94	11¼	27	4
27	5⅞	25	5¾	28	5⅝	39	4¾	95	11⅝	39	4¾	95	11⅜	28	4¼
28	6¼	26	6	29	5¾	40	4⅞	96	11¾	40	4¾	96	11½	29	4¼
29	6⅜	27	6¼	30	6	41	5	97	11¾	41	4⅞	97	11⅝	30	4½
30	6⅝	28	6⅜	31	6¼	42	5⅛	98	11⅞	42	5	98	11¾	31	4⅝
31	6¾	29	6¾	32	6⅜	43	5¼	99	12⅛	43	5⅛	99	11⅞	32	4¾
32	7	30	6⅞	33	6⅝	44	5⅜	100	12¼	44	5¼	100	12	33	4⅞
33	7¼	31	7⅛	34	6¾	45	5½	101	12¼	45	5⅜	101	12⅛	34	5⅛
34	7½	32	7⅜	35	7	46	5⅝	102	12⅜	46	5½	102	12¼	35	5¼
35	7¾	33	7⅝	36	7¼	47	5¾	103	12⅝	47	5⅝	103	12⅜	36	5⅜
36	7⅞	34	7¾	37	7⅜	48	5⅞	104	12¾	48	5¾	104	12½	37	5½
37	8⅛	35	8	38	7⅝	49	6⅛	105	12¾	49	5⅞	105	12⅝	38	5¾
38	8⅜	36	8¼	39	7¾	50	6¼	106	12⅞	50	6	106	12¾	39	5¾
39	8⅝	37	8½	40	8	51	6¼	107	13	51	6⅛	107	12¾	40	6
40	8¾	38	8¾	41	8¼	52	6½	108	13¼	52	6¼	108	13	41	6⅛
41	9	39	9	42	8⅜	53	6⅝	109	13¼	53	6¼	109	13⅛	42	6¼
42	9¼	40	9¼	43	8⅝	54	6¾	110	13⅜	54	6½	110	13¼	43	6⅜
43	9½			44	8¾	55	6¾	111	13½	55	6⅝			44	6⅝
44	9¾			45	9	56	6⅞	112	13¾	56	6¾			45	6¾
45	9⅞			46	9¼	57	7	113	13¾	57	6¾			46	6⅞
46	10⅛			47	9⅜	58	7⅛	114	13⅞	58	7			47	7
47	10¼			48	9⅝	59	7¼	115	14	59	7⅛			48	7¼
48	10⅝			49	9¾	60	7¼	116	14¼	60	7¼			49	7¼
49	10¾			50	10	61	7⅜	117	14¼	61	7¼			50	7½
50	11			51	10¼	62	7⅝	118	14⅜	62	7⅜			51	7⅝
51	11¼			52	10⅜	63	7¾	119	14½	63	7½			52	7¾
52	11⅜			53	10⅝	64	7¾	120	14⅝	64	7¾			53	7⅞
53	11¾			54	10¾	65	7⅞			65	7¾			54	8⅛
54	11⅞			55	11	66	8			66	7⅞			55	8¼
55	12⅛			56	11¼	67	8¼			67	8			56	8⅜
56	12¼			57	11⅜	68	8¼			68	8⅛			57	8½
57	12½			58	11⅝	69	8⅜			69	8¼			58	8¾
58	12¾			59	11¾	70	8½			70	8⅜			59	8¾
59	13			60	12	71	8⅝			71	8½			60	9
60	13¼					72	8¾			72	8⅝			61	9⅛
						73	8⅞			73	8¾			62	9¼
						74	9			74	8⅞			63	9⅜
						75	9⅛			75	9			64	9⅝
						76	9¼			76	9⅛			65	9¾
						77	9⅜			77	9¼			66	9⅞
						78	9⅜			78	9⅜			67	10
						79	9⅝			79	9½			68	10¼
						80	9¾			80	9⅝			69	10¼
						81	9⅞			81	9¾			70	10½
						82	10			82	9¾				
						83	10⅛			83	10				
						84	10¼			84	10⅛				
						85	10⅜			85	10¼				
						86	10½			86	10¼				

LUGGER AND LATEEN [illegible] SCHOONERS.

MA[illegible] to Masts, Booms, and Bowsprits.

Length of Masts &c.		Lugger.													Bowsprit.				Top-mast.				Brigs forward			
															Cutters		Bermuda Schoon.		Cutters		Schoon.		Top-mast.		Top-gallant mast.	
Hounded Length.	Whole length	Diameter.	Hounded length.	Whole length of Mast.	Diameter.	Hounded length.									Length.	Diameter.	Length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.
20	22.0	4¾	76	83.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]														
21	23.1	5	77	84.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]														
22	24.2	5¼	78	85.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]														
23	25.3	5½	79	86.9	19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]														
24	26.4	5¾	80	88.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]														
25	27.5	6	81	89.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15	8¼	15	9	15	3⅜	15	4¼	14	5¼	15	[illegible]
26	28.6	6¼	82	90.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16	8¾	16	9½	16	3⅝	16	4½	15	5⅝	16	[illegible]
27	29.7	6½	83	91.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4⅝	17	9¼	17	10⅛	17	3⅞	17	4¾	16	5⅞	17	[illegible]
28	30.8	6¾	84	92.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4⅞	18	9⅝	18	10½	18	4⅛	18	5	17	6¼	18	6
29	31.9	7	85	93.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5⅛	19	10⅛	19	11¼	19	4⅜	19	5¼	18	6⅝	19	6¼
30	33.0	7⅛				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5⅜	20	11	20	12	20	4⅝	20	5½	19	7	20	6½
31	34.1	7⅜				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5⅝	21	11¼	21	12½	21	4⅞	21	5¾	20	7¼	21	6¾
32	35.2	7⅝				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	22	12⅛	22	13¼	22	5⅛	22	6¼	21	7⅝	22	7⅛
33	36.3	7⅞				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6¼	23	12⅜	23	13¾	23	5¼	23	6½	22	8	23	7½
34	37.4	8⅛				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6⅝	24	13¼	24	14¼	24	5½	24	6¾	23	8¼	24	7¾
35	38.5	8⅜				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25	6⅞	25	13¾	25	15	25	5¾	25	7	24	8⅝	25	[illegible]
36	39.6	8⅝				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7⅛	26	14⅛	26	15½	26	6	26	7¼	25	9⅛	26	[illegible]
37	40.7	8⅞				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7⅜	27	14¾	27	16¼	27	6¼	27	7½	26	9⅜	27	[illegible]
38	41.8	9⅛				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28	7⅝	28	15⅛	28	16¾	28	6⅜	28	7¾	27	9¾	28	8⅞
39	42.9	9⅜				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29	8⅛	29	15⅝	29	17½	29	6⅝	29	8⅛	28	10⅛	29	9¼
40	44.0	9⅝				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30	8⅜	30	16⅛	30	18	30	6⅞	30	8⅜	29	10⅜	30	9½
41	45.1	9¾				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31	8⅝	31	17	31	18¾	31	7⅛	31	8⅝	30	10¾	31	9¾
42	46.2	10⅛				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32	9	32	17⅜	32	19¼	32	7⅜	32	9	31	11⅛	32	10
43	47.3	10⅜				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33	9¼	33	18¼	33	19¾	33	7½	33	9¼	32	11⅜	33	10¼
44	48.4	10⅝				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34	9⅝	34	18¾	34	20¼	34	7¾	34	9½	33	11⅝	34	10⅜
45	49.5	10¾				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35	9⅞	35	19⅛	35	21	35	8	35	9¾	34	12⅛	35	10⅝
46	50.6	11				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36	10¼	36	19¾	36	21½	36	8¼	36	10⅛	35	12⅜		
47	51.7	11¼				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37	10½	37	20¼	37	22¼	37	8½	37	10⅜	36	12⅝		
48	52.8	11½				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11⅛	38	10¾	38	20⅞	38	22¾	38	8¾	38	10⅝	37	13⅛		
49	53.9	11¾				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11⅜	39	11⅛	39	21⅜	39	23½	39	9	39	10⅞	38	13⅜		
50	55.0	12				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11½	40	11⅜	40	22	40	24	40	9¼	40	11¼	39	14		
51	56.1	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11⅝	41	11⅝					41	9½	41	11½	40	14⅜		
52	57.2	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12	42	12					42	9¾	42	11¾				
53	58.3	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12⅛	43	12¼					43	9⅞	43	12				
54	59.4	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12¼	44	12⅜					44	10⅛	44	12¼				
55	60.5	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12⅜	45	12⅝					45	10⅜	45	12½				
56	61.6	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	61	12¾	46	13¼					46	10⅝	46	12¾				
57	62.7	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	62	13	47	13½					47	10¾	47	13¼				
58	63.8	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63	13¼	48	13¾					48	11	48	13½				
59	64.9	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	64	13⅜	49	14⅛					49	11¼	49	13¾				
60	66.0	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65	13½	50	14⅜					50	11½	50	14				
61	67.1	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	19¾	66	13⅝	51	14⅝							51	14¼				
62	68.2	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	20¼	67	14⅛	52	15							52	14½				
63	69.3	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	20½	68	14¼	53	15¼							53	14¾				
64	70.4	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	20¾	69	14½	54	15⅜							54	15⅛				
65	71.5	[illegible]				[illegible]	[illegible]	[illegible]	79.1	21	70	14⅝	55	15⅝							55	15⅜				
66	72.6	[illegible]				[illegible]	[illegible]	[illegible]	80.2	21¼	71	14⅞	56	16¼							56	15⅝				
67	73.7	[illegible]				[illegible]	[illegible]	[illegible]	81.3	21½	72	15⅛	57	16½							57	16				
68	74.8	[illegible]				[illegible]	[illegible]	[illegible]	82.4	21¾	73	15¼	58	16¾							58	16¼				
69	75.9	[illegible]				[illegible]	[illegible]	[illegible]	83.6	22¼	74	15½	59	17⅛							59	16½				
70	77.0	[illegible]				[illegible]	[illegible]	[illegible]	84.7	22½	75	15⅝	60	17⅜							60	16¾				
71	78.1	[illegible]				[illegible]	[illegible]	[illegible]	85.8	22¾	76	16	61	17⅝												
72	79.2	[illegible]				[illegible]	[illegible]	[illegible]	87.0	23¼	77	16¼	62	18												
73	80.3	[illegible]				[illegible]	[illegible]	[illegible]	88.1	23⅜	78	16⅜														
74	81.4	[illegible]				[illegible]	[illegible]	[illegible]	89.2	23½	79	16½														
75	82.5	[illegible]				[illegible]	[illegible]	80	90.4	24	80	16¾														

[illegible] are frequently the diameters [illegible] bowsprits, about $\frac{1}{20}$ smaller than [illegible] Cruisers, and as given [illegible] s.

CUTTERS AND SCHOONERS.

Diameters of Yards, Gaffs, and Booms.

GAFFS.						YARDS.										SCHOONERS.				BOOMS.					
Cutter.		Bermuda & common Schooner.		Try-sail-gaff.		Lower.		Square-sail.		Top-sail.		Top-gallant.		Royal.		Jib-boom.		Flying Jib-boom.		Swinging.		Square-sail.		Ring-tail.	
Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
12	3¼	15	3¾	14	5⅝	25	5¾	25	4	15	3	15	3	15	2¾	15	4½	20	3⅝	15	3	15	3	15	2¾
13	3⅜	16	4	15	5⅞	26	6	26	4¼	16	3¼	16	3¼	16	2⅞	16	4¾	21	3¾	16	3¼	16	3¼	16	2⅞
14	3½	17	4¼	16	6¼	27	6¼	27	4⅜	17	3⅜	17	3⅜	17	3⅛	17	5⅛	22	4	17	3⅜	17	3⅜	17	3⅛
15	3⅝	18	4½	17	6⅝	28	6⅜	28	4½	18	3⅝	18	3⅝	18	3¼	18	5⅜	23	4⅛	18	3⅝	18	3⅝	18	3¼
16	3¾	19	4¾	18	6⅞	29	6¾	29	4⅝	19	3¾	19	3¾	19	3⅜	19	5¾	24	4¼	19	3¾	19	3¾	19	3⅜
17	3⅞	20	5	19	7¼	30	6⅞	30	4¾	20	4	20	4	20	3⅝	20	6	25	4½	20	4	20	4	20	3⅝
18	4	21	5¼	20	7⅝	31	7⅛	31	5	21	4¼	21	4¼	21	3¾	21	6¼	26	4¾	21	4¼	21	4¼	21	3¾
19	4¼	22	5½	21	7⅞	32	7⅜	32	5⅛	22	4⅜	22	4⅜	22	4	22	6⅝	27	4⅞	22	4⅜	22	4⅜	22	4
20	4½	23	5¾	22	8¼	33	7⅝	33	5¼	23	4⅝	23	4⅝	23	4⅛	23	6⅞	28	5	23	4⅝	23	4⅝	23	4⅛
21	4¾	24	6	23	8⅝	34	7¾	34	5⅜	24	4¾	24	4¾	24	4¼	24	7¼	29	5¼	24	4¾	24	4¾	24	4¼
22	5	25	6¼	24	8⅞	35	8	35	5⅝	25	5	25	5	25	4½	25	7½	30	5⅜	25	5	25	5	25	4½
23	5¼	26	6½	25	9¼	36	8¼	36	5¾	26	5¼	26	5¼	26	4¾	26	7¾	31	5⅝	26	5¼	26	5¼	26	4¾
24	5½	27	6¾	26	9⅝	37	8½	37	5⅞	27	5⅜	27	5⅜	27	4⅞	27	8⅛	32	5¾	27	5⅜	27	5⅜	27	4⅞
25	5¾	28	7	27	9⅞	38	8¾	38	6⅛	28	5⅝	28	5⅝	28	5	28	8⅜	33	6	28	5⅝	28	5⅝	28	5
26	6	29	7¼	28	10¼	39	9	39	6¼	29	5¾	29	5¾	29	5¼	29	8¾	34	6⅛	29	5¾	29	5¾	29	5¼
27	6¼	30	7½	29	10⅝	40	9¼	40	6⅜	30	6	30	6	30	5⅜	30	9	35	6¼	30	6	30	6	30	5⅜
28	6½	31	7¾	30	10⅞	41	9⅜	41	6⅝	31	6¼	31	6¼	31	5⅝	31	9¼	36	6½	31	6¼	31	6¼	31	5⅝
29	6¾	32	8	31	11¼	42	9¾	42	6¾	32	6⅜	32	6⅜	32	5¾	32	9⅝			32	6⅜	32	6⅜	32	5¾
30	7	33	8¼	32	11⅝	43	9⅞	43	6⅞	33	6⅝	33	6⅝	33	5⅞	33	9⅞			33	6⅝	33	6⅝	33	5⅞
31	7¼	34	8½	33	11⅞	44	10⅛	44	7	34	6¾	34	6¾	34	6⅛	34	10¼			34	6¾	34	6¾	34	6⅛
32	7½	35	8¾	34	12¼	45	10¼	45	7¼	35	7	35	7	35	6¼	35	10½			35	7	35	7	35	6¼
33	7¾	36	9	35	12⅝	46	10⅜	46	7⅜	36	7¼	36	7¼			36	10¾			36	7¼	36	7¼	36	6½
34	8	37	9¼	36	12⅞	47	10¾	47	7½	37	7⅜	37	7⅜			37	11			37	7⅜	37	7⅜	37	6¾
35	8¼	38	9½	37	13¼	48	11	48	7¾	38	7⅝	38	7⅝			38	11⅜			38	7⅝	38	7⅝	38	6⅞
36	8½	39	9¾	38	13⅝	49	11¼	49	7⅞	39	7¾	39	7¾			39	11¾			39	7¾	39	7¾	39	7
37	8¾	40	10	39	13⅞	50	11½	50	8	40	8	40	8			40	12			40	8	40	8	40	7¼
38	9			40	14¼	51	11¾	51	8⅛	41	8¼											41	8¼		
39	9¼					52	12	52	8¼	42	8⅜											42	8⅜		
40	9½					53	12¼	53	8½	43	8⅝											43	8⅝		
41	9¾					54	12⅜	54	8⅝	44	8¾											44	8¾		
42	10					55	12⅝	55	8¾	45	9											45	9		
43	10¼					56	12⅞	56	9																
44	10½					57	13⅛	57	9⅛																
45	10¾					58	13¼	58	9¼																
46	11					59	13⅝	59	9⅜																
47	11¼					60	13¾	60	9½																

CUTTERS AND SCHOONERS.

Diameters for Masts, Booms, and Bowsprits.

Hounded Length.	Lower-masts.												Main Boom.		Bowsprit.						Top-mast.				Brigs forward.			
	Cutters.*		Mizen-mast to Yawl & Ketches.			Common Schooners.			Bermuda Schooners.				Cutters and Schoon.		Cutters.		Common Schoon.		Bermuda Schoon.		Cutters.		Schoon.		Top-mast.		Top-gallant-mast.	
	Whole length.	Diameter.	Hounded length.	Whole length.	Diameter.	Hounded length.	Whole length.	Diameter.	Hounded length.	Whole length.	Diameter.		Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.
30	36.	9	30	33.6	7½	30	33.6	9	30	33.9	9		30	6¼	15	4	15	8¼	15	9	15	3⅜	15	4¼	14	5½	15	5¾
31	37.2	9¼	31	34.7	7½	31	34.7	9¼	31	35.0	9¼		31	6½	16	4¼	16	8¾	16	9⅝	16	3¼	16	4½	15	5⅝	16	5½
32	38.4	9⅜	32	35.9	7¾	32	35.9	9⅝	32	36.1	9⅝		32	6¾	17	4½	17	9¼	17	10¼	17	3¾	17	4¾	16	5¾	17	5¾
33	39.6	9⅞	33	37.0	8	33	37.0	9⅞	33	37.3	9⅞		33	6⅞	18	4¾	18	9⅞	18	10¾	18	4⅛	18	5	17	6¼	18	6
34	40.8	10¼	34	38.1	8¼	34	38.1	10¼	34	38.4	10¼		34	7⅛	19	5⅛	19	10⅛	19	11⅛	19	4⅜	19	5¼	18	6½	19	6¼
35	42.0	10⅝	35	39.2	8½	35	39.2	10½	35	39.5	10½		35	7¼	20	5⅜	20	11	20	12	20	4⅝	20	5⅝	19	7	20	6⅝
36	43.2	10⅞	36	40.3	8¾	36	40.3	10¾	36	40.6	10¾		36	7⅝	21	5¾	21	11½	21	12⅝	21	4¾	21	5⅞	20	7¼	21	6⅞
37	44.4	11¼	37	41.5	9	37	41.5	11⅛	37	41.8	11⅛		37	7¾	22	6	22	12⅛	22	13¼	22	5⅛	22	6¼	21	7¾	22	7¼
38	45.6	11½	38	42.6	9¼	38	42.6	11⅜	38	42.9	11⅜		38	8	23	6¼	23	12⅝	23	13¾	23	5⅜	23	6⅝	22	8	23	7½
39	46.8	11⅞	39	43.7	9½	39	43.7	11¾	39	44.0	11¾		39	8¼	24	6⅝	24	13¼	24	14⅛	24	5½	24	6¾	23	8¼	24	7¾
40	48.0	12¼	40	44.8	9¾	40	44.8	12	40	45.2	12		40	8½	25	6⅞	25	13¾	25	15	25	5¾	25	7	24	8¾	25	8
41	49.2	12½	41	46.0	10	41	46.0	12¼	41	46.3	12¼		41	8⅝	26	7¼	26	14¼	26	15⅝	26	6	26	7¼	25	9⅛	26	8¼
42	50.4	12¾	42	47.1	10¼	42	47.1	12⅝	42	47.4	12⅝		42	8¾	27	7½	27	14¾	27	16¼	27	6¼	27	7½	26	9½	27	8½
43	51.6	13⅛	43	48.2	10⅜	43	48.2	12⅞	43	48.5	12⅞		43	9	28	7¾	28	15¼	28	16¾	28	6⅝	28	7¾	27	9¾	28	8¾
44	52.8	13⅜	44	49.3	10¾	44	49.3	13¼	44	49.7	13¼		44	9¼	29	8⅛	29	15⅞	29	17⅜	29	6¾	29	8⅛	28	10⅛	29	9⅛
45	54.0	13¾	45	50.4	11	45	50.4	13½	45	50.8	13½		45	9⅜	30	8⅜	30	16½	30	18	30	6⅞	30	8⅜	29	10½	30	9⅜
46	55.2	14⅛	46	51.6	11¼	46	51.6	13¾	46	51.9	13¾		46	9¾	31	8¾	31	17	31	18⅝	31	7⅛	31	8¾	30	10¾	31	9¾
47	56.4	14½	47	52.7	11½	47	52.7	14⅛	47	53.1	14⅛		47	9⅞	32	9	32	17⅝	32	19¼	32	7⅜	32	9	31	11¼	32	10
48	57.6	14¾	48	53.8	11¾	48	53.8	14⅜	48	54.2	14⅜		48	10⅛	33	9¼	33	18⅛	33	19¾	33	7⅝	33	9¼	32	11½	33	10¼
49	58.8	15	49	54.9		49	54.9	14¾	49	55.3	14¾		49	10¼	34	9⅝	34	18⅝	34	20⅜	34	7¾	34	9½	33	11¾	34	10½
50	60.0	15⅜	50	56.1		50	56.1	15	50	56.5	15		50	10½	35	9⅞	35	19¼	35	21	35	8	35	9¾	34	12¼	35	10¾
51	61.2	15¾				51	57.1	15¼	51	57.6	15¼		51	10¾	36	10¼	36	19¾	36	21⅞	36	8¼	36	10⅛	35	12½		
52	62.4	16				52	58.2	15⅝	52	58.7	15⅝		52	10⅞	37	10½	37	20¼	37	22¼	37	8½	37	10⅜	36	12⅞		
53	63.6	16⅜				53	59.3	15⅞	53	59.8	15⅞		53	11⅛	38	10¾	38	20⅞	38	22¾	38	8¾	38	10⅝	37	13¼		
54	64.8	16⅝				54	60.4	16¼	54	61.0	16¼		54	11¼	39	11⅛	39	21⅜	39	23⅜	39	9	39	10⅞	38	13⅝		
55	66.0	17				55	61.6	16½	55	62.1	16½		55	11½	40	11⅜	40	22	40	24	40	9¼	40	11¼	39	14		
56	67.2	17¼				56	62.7	16¾	56	63.2	16¾		56	11¾	41	11¾					41	9⅜	41	11½	40	14⅜		
57	68.4	17⅝				57	63.8	17⅛	57	64.4	17⅛		57	12	42	12					42	9⅝	42	11¾				
58	69.6	17⅞				58	64.9	17⅜	58	65.5	17⅜		58	12¼	43	12¼					43	9⅞	43	12				
59	70.8	18¼				59	66.	17¾	59	66.6	17¾		59	12½	44	12⅝					44	10⅛	44	12¼				
60	72.0	18⅝				60	67.2	18	60	67.8	18		60	12⅝	45	12⅞					45	10¼	45	12⅝				
61	73.2	18⅞				61	68.3	18¼	61	68.9	18¼		61	12¾	46	13¼					46	10⅝	46	12⅞				
62	74.4	19¼				62	69.4	18⅝	62	70.0	18⅝		62	13	47	13½					47	10¾	47	13¼				
63	75.6	19½				63	70.5	18⅞	63	71.1	18⅞		63	13¼	48	13¾					48	11	48	13½				
64	76.0	19¾				64	71.6	19¼	64	72.3	19¼		64	13⅜	49	14⅛					49	11¼	49	13¾				
65	78.0	20¼				65	72.8	19½	65	73.4	19½		65	13⅝	50	14⅜					50	11½	50	14				
66	79.2	20½				66	73.9	19¾	66	74.5	19¾		66	13⅞	51	14¾							51	14¼				
67	80.4	20¾				67	75.0	20⅛	67	75.7	20⅛		67	14⅛	52	15							52	14⅝				
68	81.6	21⅛				68	76.1	20⅜	68	76.8	20⅜		68	14¼	53	15¼							53	14¾				
69	82.8	21½				69	77.2	20¾	69	77.9	20¾		69	14½	54	15⅝							54	15⅛				
70	84.0	21¾				70	78.4	21	70	79.1	21		70	14¾	55	15⅞							55	15⅜				
71	85.2	22⅛				71	79.5	21¼	71	80.2	21¼		71	14⅞	56	16¼							56	15¾				
72	86.4	22½				72	80.6	21⅝	72	81.3	21⅝		72	15⅛	57	16½							57	16				
73	87.6	22¾				73	81.7	21⅞	73	82.4	21⅞		73	15¼	58	16¾							58	16¼				
74	88.8	23				74	82.8	22¼	74	83.6	22¼		74	15½	59	17⅛							59	16½				
75	90.0	23⅜				75	84.0	22½	75	84.7	22½		75	15¾	60	17⅜							60	16¾				
76	91.2	23¾				76	85.1	22¾	76	85.8	22¾		76	16	61	17¾												
77	92.4	24				77	86.2	23⅛	77	87.0	23⅛		77	16¼	62	18												
78	93.6	24¼				78	87.3	23⅜	78	88.1	23⅜		78	16⅜														
79	94.8	24⅝				79	88.4	23¾	79	89.2	23¾		79	16⅝														
80	96.0	25				80	89.6	24	80	90.4	24		80	16¾														
81	97.2	25¼																										
82	98.4	25⅝																										

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* Yachts, rigged as Cutters, have frequently the diameters of their bowsprits, about $\frac{1}{20}$ smaller than those commonly given to Revenue Cruizers, and as given in these Tables.

CUTTERS AND SCHOONERS.

Diameters of Yards, Gaffs, and Booms.

GAFFS.						YARDS.										SCHOONERS.				BOOMS.					
Cutter.		Bermuda & common Schooner.		Try-sail-gaff.		Lower.		Square-sail.		Top-sail.		Top-gallant.		Royal.		Jib-boom.		Flying Jib-boom.		Swinging.		Square-sail.		Ring-tail.	
Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
12	3¼	15	3¾	14	5⅝	25	5¾	25	4	15	3	15	3	15	2¾	15	4½	20	3⅝	15	3	15	3	15	2¾
13	3⅜	16	4	15	5⅞	26	6	26	4⅛	16	3¼	16	3¼	16	2⅞	16	4¾	21	3¾	16	3¼	16	3¼	16	2⅞
14	3½	17	4¼	16	6¼	27	6¼	27	4⅜	17	3⅜	17	3⅜	17	3⅛	17	5⅛	22	4	17	3⅜	17	3⅜	17	3⅛
15	3⅝	18	4½	17	6⅝	28	6⅜	28	4½	18	3⅝	18	3⅝	18	3¼	18	5⅜	23	4⅛	18	3⅝	18	3⅝	18	3¼
16	3¾	19	4¾	18	6⅞	29	6⅝	29	4⅝	19	3¾	19	3¾	19	3⅜	19	5¾	24	4¼	19	3¾	19	3¾	19	3⅜
17	3⅞	20	5	19	7¼	30	6⅞	30	4¾	20	4	20	4	20	3⅝	20	6	25	4½	20	4	20	4	20	3⅝
18	4	21	5¼	20	7⅝	31	7⅛	31	5	21	4¼	21	4¼	21	3¾	21	6¼	26	4¾	21	4¼	21	4¼	21	3¾
19	4¼	22	5½	21	7⅞	32	7⅜	32	5⅛	22	4⅜	22	4⅜	22	4	22	6⅝	27	4⅞	22	4⅜	22	4⅜	22	4
20	4½	23	5¾	22	8¼	33	7⅝	33	5¼	23	4⅝	23	4⅝	23	4⅛	23	6⅞	28	5	23	4⅝	23	4⅝	23	4⅛
21	4¾	24	6	23	8⅝	34	7¾	34	5⅜	24	4¾	24	4¾	24	4¼	24	7¼	29	5¼	24	4¾	24	4¾	24	4¼
22	5	25	6¼	24	8⅞	35	8	35	5⅝	25	5	25	5	25	4½	25	7½	30	5⅜	25	5	25	5	25	4½
23	5¼	26	6½	25	9¼	36	8¼	36	5¾	26	5¼	26	5¼	26	4¾	26	7¾	31	5⅝	26	5¼	26	5¼	26	4¾
24	5½	27	6¾	26	9⅝	37	8½	37	5⅞	27	5⅜	27	5⅜	27	4⅞	27	8⅛	32	5¾	27	5⅜	27	5⅜	27	4⅞
25	5¾	28	7	27	9⅞	38	8¾	38	6⅛	28	5⅝	28	5⅝	28	5	28	8⅜	33	6	28	5⅝	28	5⅝	28	5
26	6	29	7¼	28	10¼	39	9	39	6¼	29	5¾	29	5¾	29	5¼	29	8¾	34	6⅛	29	5¾	29	5¾	29	5¼
27	6¼	30	7½	29	10⅝	40	9¼	40	6⅜	30	6	30	6	30	5⅜	30	9	35	6¼	30	6	30	6	30	5⅜
28	6½	31	7¾	30	10⅞	41	9⅜	41	6⅝	31	6¼	31	6¼	31	5⅝	31	9¼	36	6½	31	6¼	31	6¼	31	5⅝
29	6¾	32	8	31	11¼	42	9⅝	42	6¾	32	6⅜	32	6⅜	32	5¾	32	9⅝			32	6⅜	32	6⅜	32	5¾
30	7	33	8¼	32	11⅝	43	9⅞	43	6⅞	33	6⅝	33	6⅝	33	5⅞	33	9⅞			33	6⅝	33	6⅝	33	5⅞
31	7¼	34	8½	33	11⅞	44	10⅛	44	7	34	6¾	34	6¾	34	6⅛	34	10¼			34	6¾	34	6¾	34	6⅛
32	7½	35	8¾	34	12¼	45	10¼	45	7¼	35	7	35	7	35	6¼	35	10½			35	7	35	7	35	6¼
33	7¾	36	9	35	12⅝	46	10⅝	46	7⅜	36	7¼	36	7¼			36	10¾			36	7¼	36	7¼	36	6½
34	8	37	9¼	36	12⅞	47	10¾	47	7½	37	7⅜	37	7⅜			37	11			37	7⅜	37	7⅜	37	6⅝
35	8¼	38	9½	37	13¼	48	11	48	7¾	38	7⅝	38	7⅝			38	11⅜			38	7⅝	38	7⅝	38	6¾
36	8½	39	9¾	38	13⅝	49	11¼	49	7⅞	39	7¾	39	7¾			39	11¾			39	7¾	39	7¾	39	7
37	8¾	40	10	39	13⅞	50	11½	50	8	40	8	40	8			40	12			40	8	40	8	40	7¼
38	9			40	14¼	51	11¾	51	8⅛	41	8¼											41	8¼		
39	9¼					52	12	52	8¼	42	8⅜											42	8⅜		
40	9½					53	12⅛	53	8⅜	43	8⅝											43	8⅝		
41	9¾					54	12⅜	54	8⅝	44	8¾											44	8¾		
42	10					55	12⅝	55	8¾	45	9											45	9		
43	10¼					56	12⅞	56	9																
44	10½					57	13⅛	57	9⅛																
45	10¾					58	13¼	58	9¼																
46	11					59	13⅜	59	9⅜																
47	11¼					60	13½	60	9½																

Ships and Brigs.—*Diameters of Lower-masts, Top-masts, Top-gallant, &c.*

Main and Fore-masts.						Mizen-masts.			Bowsprits.				Jib-boom.		Flying Jib-boom.		Top-masts.				Top-gal.-masts.	
Given Lengths.	Hounded Length.	Diameter.	Given Lengths.	Hounded Length.	Diameter.	Given Lengths.	Hounded Length.	Diameter.	Given Lengths.	Diameter.	Given Lengths.	Diameter.	Lengths.	Diameter.	Lengths.	Diameter.	Given Lengths.	Diameter.	Given Lengths.	Diameter.	Given Lengths.	Diameter.
123	105.9	41	64	55.1	19¾	90	78.7	27	80	40	Yachts.		60	17¾	60	9¼	80	24	31	10	40	13⅜
122	105.0	40⅝	63	54.2	19½	89	77.8	26¾	79	39½	45	20¼	59	17½	59	9⅛	79	23¾	30	9¾	39	13
121	104.2	40¼	62	53.3	19¼	88	77.0	26⅜	78	39	44	19¾	58	17⅛	58	9	78	23½	29	9½	38	12⅝
120	103.3	40	61	52.5	18⅞	87	76.1	26⅛	77	38½	43	19¼	57	16¾	57	8¾	77	23¼	28	9⅜	37	12⅜
119	102.4	39⅝	60	51.6	18⅝	86	75.2	25¾	76	38	42	18⅞	56	16½	56	8⅝	76	22⅞	27	8¾	36	12
118	101.5	39¼	59	50.7	18¼	85	74.3	25½	75	37½	41	18⅜	55	16¼	55	8½	75	22⅝	26	8½	35	11⅝
117	100.7	39	58	49.8	18	84	73.5	25¼	74	37	40	18	54	16	54	8¼	74	22¼	25	8¼	34	11⅜
116	99.8	38⅝	57	49.0	17¾	83	72.6	24⅞	73	36½	39	17½	53	15⅝	53	8⅛	73	22	Mizen		33	11
115	99.0	38¼	56	48.1	17⅜	82	71.7	24⅝	72	36	38	17⅛	52	15⅜	52	8	72	21¾	Top-mast.		32	10⅝
114	98.1	38	55	47.2	16	81	70.8	24¼	71	35½	37	16⅝	51	15	51	7¾	71	21½	54	15	31	10⅜
113	97.2	37⅝	54	46.5	15¾	80	70.0	24	70	35	36	16¼	50	14¾	50	7½	70	21¼	53	14¾	30	10
112	96.4	37¼	Brigs.			79	69.1	23¾	69	34½	35	15¾	59	14½	49	7⅜	69	20¾	52	14½	29	9⅝
111	95.5	37	70	60.2	23⅝	78	68 2	23⅜	68	34	34	15¼	48	14¼	48	7¼	68	20½	51	14¼	28	9⅜
110	94.7	36⅝	69	59.3	22⅞	77	67 3	23¼	67	33½	33	14¾	47	14⅛	47	7⅛	67	20¼	50	14	27	9
109	93.8	36¼	68	58.4	22½	76	66.4	22¾	66	33	32	14⅜	46	13¾	46	7	66	19¾	49	13¾	26	8⅝
108	93.0	36	67	57.6	22⅛	75	65.6	22	65	32½	31	13⅞	45	13½	45	6⅞	65	19½	48	13¼	25	8⅜
107	92.1	35⅝	66	56.7	21¾	74	64.7	21⅝	64	32	30	13½	44	13¼	44	6¾	64	19¼	47	13	24	8
106	91.3	35¼	65	55.9	21⅜	73	63.8	21¼	63	31½			43	12⅞	43	6⅝	63	18⅞	46	12⅝	23	7⅝
105	90.4	35	64	55.0	21⅛	72	63.0	21	62	31			42	12⅝	42	6½	62	18⅝	45	12¼	22	7⅜
104	89.6	34⅝	63	54.2	20¾	71	62.1	20¾	61	30½			41	12¼	41	6¼	61	18¼	44	12	21	7
103	88.7	34¼	62	53.3	20½	70	61.2	20⅜	60	30			40	12	40	6⅛	60	18	43	11¾	20	6⅝
102	87.9	34	61	52.4	20⅛	69	60.3	20⅛	59	29½			39	11⅝	39	5⅞	59	17¾	42	11½	19	6⅜
101	87.0	33⅝	60	51 6	19¾	68	59.4	19⅞	58	29			38	11¼	38	5¾	58	17½	41	11¼	18	6
100	86.2	33¼	59	50.7	19⅜	67	58.6	19⅜	57	28½			37	11⅛	37	5⅝	57	17¼	40	11⅛	17	5⅝
99	85.3	33	58	49.8	19⅛	66	57.7	19¼	56	28			36	10⅞	36	5⅜	56	16⅞	39	11	16	5⅜
98	84.4	32¼	57	49.0	18¾	65	56.8	19	55	27½			35	10⅝	35	5¼	55	16½	38	10⅞	15	5
97	83.5	32	56	48.2	18½	64	56.0	18¾	54	27			34	10¼	34	5⅛	54	16¼	37	10¾	14	4⅝
96	82.6	32	55	47.3	18⅛	63	55.1	18⅜	53	26½			33	9⅞	33	5	53	15¾	36	10½	13	4⅜
95	81.7	31⅝	54	46.4	17¾	62	54.2	18⅛	52	26			32	9⅝	32	4¾	52	15½	35	10¼	12	4
94	80.9	31¼	53	45.5	17½	61	53.3	17¾	51	25½			31	9¼	31	4⅝	51	15¼	34	10		
93	80.0	30⅞	52	44.7	17¼	60	53.3	17½	50	25			30	9	30	4½	50	15	33	9¾		
92	79.1	30½	51	43.8	16¾	59	52.5	17¼	49	24½			29	8⅝	29	4⅜	49	14¾	32	9½		
91	78.2	29⅞	50	43.0	16½	58	51.6	16⅞	48	24			28	8⅜	28	4¼	48	14½	31	9¼		
90	77.4	29½	49	42.1	16¼	57	50.6	16⅝	47	23½			27	8⅛	27	4	47	14¼	30	9		
89	76.5	28⅞	48	41.3	15¾	56	49.7	16¼	46	23			26	7⅞	26	3¾	46	14	29	8¾		
88	75.7	28½	47	40.3	15½	55	48.8	16⅛	45	22½			25	7⅝	25	3½	45	13¾	28	8½		
87	74.9	27¾	46	39.5	15¼	54	48.0	15¾	44	22			24	7⅜			44	13½	27			
86	74.0	27½	45	38.7	14¾	53	47.1	15½	43	21			23	7¼			43	13¼	25			
85	73.1	27¼	44	37.8	14½	52	46.2	15¼	42	21			22	7⅛			42	13	25			
84	72.3	26⅞	43	37.0	14¼	51	45 3	14⅞	41	20½			21	7			41	12¾				
83	71.4	26½	42	36.1	13¾	50	44.4	14⅝	40	20			20	6⅞			40	12½				
82	70.6	26¼	41	35.3	13½	49	43.5	14¼	39	19½							39	12¼				
81	69.8	25⅞	40	34.4	13¼	48	42.6	14	38	19							38	12				
80	69.0	25½	Yachts.			47	41.7	13¾	37	18½							37	11¾				
79	68.1	25⅛	70	60.2	21	46	40.8	13⅜	36	18							36	11½				
78	67.2	24¾	69	59.3	20¾	45	40.0	13⅛	35	17½							35	11¼				
77	66.3	24¼	68	58.4	20⅜	44	39.1	12¾	34	17							34	10¾				
76	65.4	23¾	67	57.6	20⅛	43	38.2	12½	33	16½							33	10½				
75	64.5	23¼	66	56.7	19¾	42	37.3	12¼	32	16							32	10¼				
74	63.7	22⅞	65	55.9	19⅜	41	36.4	12	31	15½												
73	62.8	22⅝	64	55.0	19¼	40	35.5	11¾	30	15												
72	62.0	22¼	63	54.2	18⅞	Yachts.																
71	61.1	22	62	53.3	18⅜	60	53.3	16¼														
70	60.2	21½	61	52.4	18¼	59	52.5	15⅞														
69	59.3	21⅜	60	51.6	18	58	51.6	15½														
68	58.4	21⅛	59	50.7	17¾	57	50.6	15⅜														
67	57.6	20¾	58	49.8	17⅜	56	49.7	15⅛														
66	56.7	20½	57	49.6	17⅛	55	48.8	14¾														
65	55.9	20⅛	56	48.2	16¾	54	48.0	14⅜														
			55	47.3	16½	53	47.1	14¼														
						52	46.2	14														
						51	45.3	13¾														
						50	44.4	13½														
						49	43.5	13¼														
						48	42.6	13														

BRIGS AND SHIPS.

Diameters of Yards, Booms, Gaffs, &c.

Lower Yards.				Top-sail, Cross-jack, & Sprit-sail.				Top-gallant.		Royal.		Driver Boom.				Gaff.		Try-sail gaff.	
Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
														Brigs.					
112	26⅝	70	16¼	85	18¼	52	10⅞	60	12	42	8⅜	76	15	60	13⅞	60	13½	25	9⅜
111	26½	69	16⅛	84	18	51	10¾	59	11¾	41	8¼	75	14¾	59	13½	59	13¼	24	9¼
110	26¼	68	15¾	83	17¾	50	10½	58	11⅝	40	8	74	14½	58	13⅜	58	13	23	9⅛
109	26	67	15⅝	82	17½	49	10¼	57	11⅜	39	7¾	73	14⅜	57	13¼	57	12⅞	22	9
108	25¾	66	15⅜	81	17¼	48	10⅛	56	11¼	38	7⅝	72	14¼	56	13	56	12⅝	21	8¾
107	25½	65	15⅛	80	17⅛	47	9⅞	55	11	37	7⅜	71	14⅜	55	12¾	55	12½	20	8½
106	25¼	64	14⅞	79	16⅞	46	9⅝	54	10¾	36	7¼	70	14⅛	54	12½	54	12⅜	19	8¼
105	25	63	14¾	78	16¾	45	9⅜	53	10⅝	35	7	69	14	53	12¼	53	12¼	18	8
104	24¾	62	14⅜	77	16½	44	9¼	52	10⅜	34	6¾	68	13⅞	52	12	52	12⅛	17	7¾
103	24½	61	14¼	76	16¼	43	9⅛	51	10¼	33	6⅝	67	13¾	51	11⅝	51	12	16	7½
102	24¼	60	14	75	16	42	8⅞	50	10	32	6⅜	66	13⅝	50	11¼	50	11¾	15	7¼
101	23⅞	59	13¾	74	15¾	41	8¾	49	9¾	31	6¼	65	13½	49	11	49	11½	14	7
100	23⅝	58	13½	73	15⅝	40	8⅝	48	9⅝	30	6	64	13¼	48	10⅞	48	11⅜	13	6¾
99	23⅜	57	13¼	72	15⅜	39	8½	47	9⅜	29	5¾	63	12⅞	47	10⅝	47	11⅛	12	6½
98	23⅛	56	13	71	15¼	38	8⅜	46	9¼	28	5⅝	62	12⅝	46	10⅜	46	11	11	6¼
97	22⅞	55	12¾	70	15	37	8¼	45	9	27	5⅜	61	12⅜	45	10¼	45	10¾	10	6
96	22⅝	54	12⅝	69	14¾	36	8⅛	44	8¾	26	5¼	60	12¼	44	10	44	10½	9	5¾
95	22⅜	53	12¼	68	14½	35	8	43	8⅝	25	5	59	12	43	9⅞	43	10¼	8	5½
94	22⅛	52	12⅛	67	14¼	34	7⅞	42	8⅜	24	4¾	58	11¾	42	9¾	42	10		
93	21⅞	51	11⅞	66	14⅛	33	7⅝	41	8¼	23	4⅝	57	11⅝	41	9½	41	9¾		
92	21⅝	50	11⅝	65	13⅞	32	7½	40	8	22	4⅜	56	11⅜	40	9¼	40	9½		
91	21½	49	11⅜	64	13¾	31	7¼	39	7¾	21	4¼	55	11¼			39	9¼		
90	21¼	48	11¼	63	13½	30	7⅛	38	7⅝	20	4	54	11			38	9		
89	21	47	10⅞	62	13¼	29	6¾	37	7⅜	19	3¾	53	10¾			37	8¾		
88	20¾	46	10¾	61	13	28	6½	36	7¼	18	3⅝	52	10⅝			36	8½		
87	20½	45	10½	60	12¾	27	6¼	35	7	17	3⅜	51	10⅜			35	8¼		
86	20¼	44	10¼	59	12⅜	26	6⅛	34	6¾	16	3¼	50	10¼			34	8		
85	20⅛	43	10	58	12¼	25	6	33	6⅝	15	3	49	10			33	7¾		
84	19¾	42	9¾	57	12	24	5¾	32	6⅜	14	2¾	48	9¾			32	7⅝		
83	19⅝	41	9½	56	11¾	23	5½	31	6¼	13	2⅝	47	9⅝			31	7½		
82	19¼	40	9¼	55	11½	22	5⅜	30	6⅛	12	2⅜	46	9⅜			30	7¼		
81	19⅛	39	9⅛	54	11¼	21	5⅛	29	6			45	9¼			29	7		
80	18⅞	38	8¾	53	11⅛	20	5	28	5⅞			44	9			28	6¾		
79	18⅝	37	8⅝					27	5¾			43	8¾			27	6½		
78	18¼	36	8⅜					26	5⅝			42	8⅝			26	6¼		
77	17⅞	35	8⅛					25	5½			41	8⅜			25	6		
76	17¾	34	7⅞					24	5¼			40	8¼			Brigs Gaff.			
75	17½	33	7¾					23	5			39	8⅛			35	9¼		
74	17¼	32	7⅜					22	4⅞			38	7⅞			34	9		
73	17	31	7¼					21	4¾			37	7¾			33	8¾		
72	16¾	30	7					20	4⅜			36	7⅝			32	8½		
71	16½							19	4⅛			35	7⅜			31	8¼		
								18	4			34	7⅛			30	8		
												33	6⅞			29	7¾		
												32	6¾			28	7⅝		
												31	6⅝			27	7⅜		
												30	6½			26	7¼		
												29	6¼			25	7⅛		
																24	7		
																23	6⅞		
																22	6¾		

The diameters given in the preceding Tables commonly follow some law of their length; this gives to lower-masts a small increase beyond what is common to the lesser masts, which would appear desirable, not only from experience, but to bring them in a nearer relation to the stresses to which they are subject, from the moment of sails above the upper wedging deck and the weights they have to sustain. For it is in consequence of the smaller masts being frequently found weak, that, in some of the principal dockyards, they have been induced to add a front fish, and hoop it, which necessarily adds to the weight, and increases the expense beyond what would be occasioned by a small increase in the diameters. In the year 1807, the diameters were established as given in Table I.; but as small masts were not found sufficiently large, all masts below 70 feet in length were, by a subsequent establishment, increased, as shown in Table II.

TABLE I.								TABLE II.													
Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter
100	31¾	89	27⅝	78	23¼	67	18⅞	123	41	112	37¼	101	32¼	90	28	79	23⅝	68	19¾	57	17
99	31⅜	88	27¼	77	22¾	66	18⅝	122	40⅝	111	37	100	31¾	89	27⅝	78	23¼	67	19½	56	16¾
98	31	87	26¾	76	22⅜	65	18¼	121	40¼	110	36⅝	99	31⅜	88	27¼	77	22¾	66	19¼	55	16½
97	30⅝	86	26½	75	22	64	18	120	40	109	36¼	98	31	87	26¾	76	22⅜	65	19	54	16¼
96	30¼	85	26	74	21⅝	63	17⅝	119	39⅝	108	36	97	30⅝	86	26¼	75	22	64	18½	53	16
95	29⅞	84	25⅝	73	21¼	62		118	39¼	107	35½	96	30¼	85	26	74	21⅝	63	18¼	52	15¾
94	29½	83	25¼	72	20¾	61		117	39	106	35	95	29⅞	84	25⅝	73	21¼	62	18¾	51	15½
93	29⅛	82	24¾	71	20½	60		116	38⅝	105	34¾	94	29½	83	25¼	72	20¾	61	18	50	15¼
92	28¾	81	24⅜	70	20⅛	59		115	38¼	104	33⅞	93	29⅛	82	24¾	71	20½	60	17¾	49	
91	28⅜	80	24	69	19¾	58		114	38	103	33¼	92	28¾	81	24⅜	70	20¼	59	17½	48	
90	28	79	23⅝	68	19⅜	57		113	37⅝	102	32¾	91	28⅜	80	24	69	20	58	17¼	47	

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* The moments of pressure on the main-mast, above the upper wedging deck, is, for three-deck ships, 573073; two-deck ships, 493060; frigates, 425194; and corvettes, 199657; where the diameters would be, to three-deck ships, 41 inches; two-deck ships, 36 inches; frigates, 31 inches, and corvettes, 21 inches. If, therefore, we were to consider the strength of masts to vary as the cubes of their diameters, which in practice would not be far from the truth, the proper diameter, in proportion to the stresses when brought in relation to the three-deck ships, would be

$$573073 : 493060 :: 41^3 : \sqrt[3]{59300} = 39 \text{ for two-deck ships,}$$
$$573073 : 425194 :: 41^3 : \sqrt[3]{51148} = 37 \text{ for frigates,}$$
$$573073 : 199657 :: 41^3 : \sqrt[3]{24011} = 28 \text{ for corvettes.}$$

This shows that the excess of strength is very considerably in favour of the three-deck ship, and which accords with experience; since the proportion of three-deck ships' masts that are sprung is very inconsiderable, when compared with ships of other classes; however, the difference of diameters will not be so great as the proportions give, since considerable allowance must be made for the excess of weight, as well as pressure, that the larger masts have to sustain.

The diameters given in the Tables for the Bowsprits fall between the limits of those common in the Navy; they are larger, when considered in proportion to their lengths, than those of the 120-gun ship, 50-gun frigate, large sloop, and 18 and 10 gun brigs; and less than those, according to their lengths, of the 74, 64, and 50 on two decks, 52-gun frigate, some of the small sloops, and 16-gun brig; but as the diameters in the Tables follow the same law of their lengths, and fall between the limits of those which have been commonly given, and which have stood the test of experience, they may be used with safety, while they give to bowsprits of different lengths an uniform weight and strength.

In some cases, in giving the diameters to different spars, it may be proper to vary them from the common proportion of their length, for the sake of supplying different classes of ships, or as in the case of the fore-top-masts and top-gallant-masts answering for the main, in the event of disaster; but as these Tables have been formed from the results of long experience, and may be considered as giving the adequate strength, any alteration from them ought to offer an equivalent to the additional weight and expense that the increase may give.

On the small Diameters of Masts, Yards, &c.

In determining the proportion that the small diameter should bear to the large, we are governed in the same manner as in fixing the large diameter; that is, by what experience has shown to be the best, and by our own observations on the effects produced on the different parts of masts, &c., when acted on most powerfully by the stresses to which they are subject.

When the small diameter is not confined by the several spars having to pass through caps, &c., as is the case with top-masts, it is better to reduce it, chiefly for the sake of lightness and appearance.

To obtain this may be desirable, so long as sufficient strength and support are preserved; but we find from our own observations on the defects of masts, &c., that this reduction is frequently carried too far, so that the standing masts have their heads constantly wrung and sprung; bowsprits are strained and sprung between the gammoning and the cap; and yards, from their having too much taper, are constantly straining and opening at their arms. From these circumstances it may be desirable that, in some cases, the proportions given at present should be increased.*

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* It is found on examining the defects of masts, especially from frigates downwards, that the wringing at the head is much more common than any other defect; that bowsprits are sprung oftener between the gammoning and the cap, about the sprit-sail-yard; and that yards are condemned from shans or strains, occasioned by the taper crossing the range of fibre too much, more commonly than from any other cause.

The Proportion that the small Diameter commonly bears to the large.

LOWER OR STANDING MASTS.

Ships and brigs	at the heel	$\frac{5}{6}$
	hound	$\frac{4}{5}$ or $\frac{3}{4}$*
	head	$\frac{3}{4}$† or $\frac{2}{3}$
Cutters	heel	$\frac{5}{6}$
	hound	$\frac{6}{7}$ or $\frac{4}{5}$ ‡
	head	$\frac{2}{3}$ or $\frac{5}{6}$
Schooners	heel	$\frac{5}{6}$
	hound	$\frac{6}{10}$ or $\frac{3}{4}$
	head	$\frac{1}{2}$ or $\frac{2}{3}$
Luggers	heel	$\frac{5}{6}$
	hound	$\frac{3}{4}$
	head	$\frac{7}{12}$
Lateen rig	heel	$\frac{5}{6}$
	hound	$\frac{5}{6}$
	head	$\frac{3}{4}$

TOP-MASTS.

Of ships and brigs	at the hounds	$\frac{4}{5}$ or $\frac{5}{7}$
	head	$\frac{9}{13}$ or $\frac{5}{9}$ §
Of cutters and schooners . . .	hounds	$\frac{10}{13}$ or $\frac{\ }{6}$
	head	$\frac{1}{2}$ or $\frac{3}{7}$
Of luggers	hounds	$\frac{10}{13}$
	pole	$\frac{1}{2}$

TOP-GALLANT-MASTS.

Of ships and brigs	at the hounds	$\frac{10}{13}$ or $\frac{4}{5}$
	sky-sail pole	$\frac{1}{2}$ or $\frac{5}{9}$

BOWSPRIT.

Of ships and brigs	at the heel . . .	$\frac{5}{6}$
	head or outer end	$\frac{2}{3}$‖

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* $\frac{3}{4}$ is the better proportion for cheeked masts, and $\frac{4}{5}$ for single-tree masts.

† The proportions commonly given are, for the heads $\frac{3}{5}$, and for the hounds $\frac{3}{4}$; the increase is given to prevent wringing; to increase it, the athwartship way for made mast at the hounds effects this best, when it may be $\frac{7}{8}$.

‡ The proportions given for the hounds and head of cutters' masts vary considerably, between the limits of $\frac{3}{4}$ and $\frac{6}{7}$; the latter is the better proportion of the given diameter for the hounds.

§ Top-masts require to be so large as to permit the hounds to pass through the cap to give the proper strength; the proportions given have been increased for that purpose; those commonly given are, for the head $\frac{5}{9}$, and for the hounds $\frac{3}{4}$ of the given diameter, or as large as the top-gallant-masts.

‖ By giving bowsprits less taper, we strengthen the part that is commonly sprung; the common proportion given is $\frac{5}{9}$ of the given diameter.

Of cutters	at the heel	1
	head or outer end	$\frac{2}{3}$ or $\frac{3}{4}$
Of schooners	at the heel	1
	head or outer end	$\frac{2}{3}$

YARDS.

Lower-yard	yard-arm	$\frac{1}{2}$
Top-sail	„	$\frac{1}{2}$ *
Top-gallant and royal	„	$\frac{3}{7}$ or $\frac{1}{2}$
Sprit-sail	„	$\frac{3}{7}$ or $\frac{1}{2}$
Cross-jack	„	$\frac{3}{7}$ or $\frac{1}{2}$
Studding-sail-yard	„	$\frac{3}{7}$ or $\frac{1}{2}$
Cutters' and schooners' square-sail	„	$\frac{1}{2}$
„ top-sail	„	$\frac{3}{7}$
Luggers' yards	„	$\frac{1}{2}$
Lateen yards	longest arm	$\frac{2}{3}$
	shortest arm	$\frac{1}{3}$

BOOMS.

Driver	outer end	$\frac{3}{4}$
	inner end	$\frac{2}{3}$
Main-boom and cutters' boom, or those worked with a sheet	outer end	$\frac{3}{4}$
	inner end	$\frac{6}{7}$
Jib-boom	outer end	$\frac{2}{3}$ or $\frac{3}{4}$
	inner end	1
Flying-jib-boom	outer end	$\frac{2}{3}$ or $\frac{3}{4}$
	inner end	$\frac{3}{4}$
Jib and flying jib-boom in one	at the stops	$\frac{2}{3}$
	at the outer end	$\frac{1}{2}$
Studding-sail-boom, swing or lower	outer end	$\frac{2}{3}$ or $\frac{3}{4}$
	inner end	$\frac{2}{3}$ or $\frac{3}{4}$

GAFFS.

Of brigs and ships	outer end	$\frac{1}{2}$ or $\frac{5}{9}$
Of cutters and schooners	„	$\frac{3}{5}$ or $\frac{5}{9}$
Try-sail-gaffs	„	$\frac{3}{5}$ or $\frac{5}{9}$

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* Both the lower and top-sail-yards, in being tapered, are frequently worked into the heart, in consequence of which they strain or open at the quarters; the increase is therefore intended to lessen this defect; the proportion commonly given for the lower-yard-arms is $\frac{5}{12}$, and for the top-sail-yard-arms $\frac{3}{7}$ of the given diameter.

On the Diameters or Forms of Masts, Yards, &c., between the given or large, and the small Diameters.

Several practical methods are used for determining the intermediate diameters or forms of the masts, &c., between the given, or greatest, and the least diameter.

Most of the rules in common use give a curve, which approaches nearer to an arc of a circle than to any other known curve, and which appears from experience to comprise the proper degree of substance and strength. The method in common use in the royal dock-yards, which is simple and of easy application, is to divide the distance between the place of the given diameter, and that of the small diameter, into four equal parts, as from the partners, or caps, to the stops or hounds, which in standing masts are called the upper quarters, and from the partners to the heel, which are called the lower quarters. These quarters are distinguished by the digits 1, 2, and 3. Then the difference between the given diameter, and the proportion for the heel, hounds, or yard-arms, &c., is divided into four parts; for the third quarter it is $\frac{1}{2}$ the difference; for the second $\frac{1}{3}$, and for the first the difference less than $\frac{1}{13}$ of the diameter.

The method used by the mast-maker to facilitate the setting off of the different proportions at the quarters, is to mark from one end of a batten, called a graduating batten, a distance equal to half the given diameter, and another equal to half the proportion for the heel, hounds, &c. (one-half is taken because all diameters are set off from a middle line, which represents the axis, and thus the form of both sides of the mast is made the same), then the difference between these two distances is divided into two equal parts, which gives $\frac{1}{2}$ the difference for the third quarter, $\frac{2}{3}$ of this $\frac{1}{2}$ from the given diameter for the second quarter, and $\frac{1}{3}$ of the $\frac{2}{3}$ of the $\frac{1}{2}$ for the first quarter.*

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* The method which the French commonly use to obtain the intermediate diameters, is as follows:

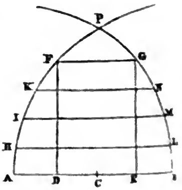

Fig. 40.

Take a line, AB, equal to half the greatest diameter; from A and B as centres, with the radius AB, describe two arcs meeting each other in P. Bisect AB in C, and on each side of C take CD and CE, equal to one-fourth of the smallest diameter; from D and E raise the perpendiculars DF and EG, meeting the arcs in F and G; join FG. Then FG is equal to DE, which is equal to half the smallest diameter.

This being done, divide the length of the mast comprised between the greatest and least diameter into a certain number of equal parts; and the space comprised between FG and AB, *Proportions commonly given to the small Diameter of Boats' Masts.*

Masts to be at the head or stops .	,66	of the greatest diameter.
Masts to be at the pole	,4	,,
Masts to be at the heel	,55	,,
Bowsprits at the outer end . . .	,75	,,
Outriggers or boomkins	,75	,,
Booms at the inner end	,8	,,
Booms at the outer end	,75	,,
Gaffs at the outer end	,55	,,
Yards at the arms or ends . . .	,6	,,
Slider or gunters at the end . .	,5	,,
(Slider or gunters to be parallel one-third of their length from the lower-end)	—	,,
Sprits at the upper end	,7	,,
Sprits at the lower end	,9	,,
(To have the greatest diameter one-third from the lower end) . . .	—	,,

When there is only a fore and mizen lug, the yard of the *fore lug* has the slings in general placed at ,23; when there are three lug-sails, at ,3; those of *main lugs* ,333, and those of mizen lugs ,22 from the tack end.

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into a like number of equal parts; then, the lines KN, IM, &c. &c., drawn through the points of division parallel to AB, will be the half diameters to the corresponding points of division of the mast.

ON

TIMBER USED IN THE MASTING OF SHIPS.

GENERAL OBSERVATIONS.

To obtain the best timber for the masts of ships is of very great importance, not only on account of its great expense, but because the safety of a ship frequently depends on its quality.

If timber used for most purposes has strength and durability, it possesses the necessary qualities; but the timber for masting must not only have these qualities, but also, as far as possible, lightness, flexibility, and elasticity. By its specific gravity, the stability of the ship is not only affected; but, in proportion to its weight, must the support necessary to sustain it be increased. If the mast possesses so great a degree of rigidity as not to yield to the sudden impulses to which it is subject, it soon becomes fractured; and if its elasticity, when bent, be not sufficient to restore it to its true position, the fibre becomes upset, and the mast weaker at every impulse.

The timbers commonly used for masts are fir and pine, which are distinguished according to the character of their leaves and cones. Duhamel says, "That the leaves of the pine are slender and filaceous, more or less long, according to the species; two, three, or more of those thin leaves proceeding from the same bud.

"It is the characteristic which distinguishes them from the fir, whose leaves are straight and separate, and all proceeding from one slight stem, similar to the teeth of a comb."

The timber used for masts is distinguished, by mast-makers, by the name of the place from which it is exported: as, the Norway and Riga firs, Canada red, yellow, and white pines, &c.*

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* There are now two kinds of red pine commonly used in the Royal Dock-yards, the Canadian and Virginian; that from Canada is seldom larger than hand mast; but is in general of a good quality. That from Virginia has more the appearance of pitch pine that has been tapped, and has sometimes a strong resinous smell; the trees are much larger, and are subject to large knots that are not so well collared as those in the red pine from Canada.

The timber that possesses, in the greatest degree, the qualities best suited for masting, is the *pinus silvestris Genevensis vulgaris,* from the vast forests of Russia, Norway, and Poland; that which is most esteemed, is obtained from the forests of Ukraine and Livonia; it is brought down the Dwina, and is commonly called Riga, on account of its being shipped from that port. In the same way, the Adriatic fir derives its name from being shipped in the Adriatic.

The great expense of Riga timber, and the difficulty there frequently is of obtaining it in time of war, have induced Great Britain, as well as other nations, to endeavour to find resources for masting their navies within their own states and colonies.

The different firs and pines, besides those of the North, used for masting the Royal Navy of Great Britain, and likewise, to a great extent, her commercial navy, are principally those from Canada, with some from Nova Scotia and the Adriatic, and a few from Scotland. The timber from Canada consists chiefly of the white or yellow pine, *pinus strobus,* commonly called the Weymouth, or white masting pine; and the white, red, and black spruce. The Scotch fir, *pinus silvestris,* is common in the highlands of Scotland, as well as in Norway, Denmark, and Sweden.

The standing masts are generally made of yellow, and the top-masts of red pine. The white, red, and black spruces are but little used, except for small spars.* Although the red and yellow pines do not possess, in an eminent degree, the good qualities which are found in those of the North, yet they have them to such an extent, especially the red pine, as to qualify them for the purposes for which they are employed. The Adriatic fir is frequently used for the masts of cutters, and other small vessels, but it does not possess particularly good qualities.

The woods that have been partially used for masts are, the poon from the East Indies, and the cowdie from New Zealand. The poon has been used for masting ships built in India; the cowdie has also been used for small standing masts, for top-masts as high as those of frigates, and even for two and three-deck ships. It possesses many of the most esteemed qualities for masting; and will probably be found very eligible for this purpose. The cowdie resembles the pine in being coniferous, and in containing a considerable quantity of resin, which exudes from it spontaneously.

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* The spruce firs from Canada appear to be different from those that grow in Norway and Denmark, the *pinus abies,* from which the white deals are cut, and many valuable spars obtained; it is a species more like the Scotch spruce.—*See " Discourse on Forest Trees," by John Evelyn, Esq., page* 284, *note by A. Hunter, M.D.*

The French, according to Forfait, M. le Roy, De Castries, and others, have received considerable supplies from Corsica, from the Pyrenees, and some from the Alps.*

To obtain supplies from the Pyrenees, they took immense pains to cut roads from the forests to the plains.† They appear likewise to have received supplies from Catalonia, Savoy, the departments of Mont Blanc, Puy de Dôme, and Cantal. These firs, however, contain but little resinous substance; the heart is porous, and the grain coarse; their flexibility is very trifling, and from a quick evaporation of their resinous matter, they soon become dry, so that they break under very slight strains.‡

The pines from the Pyrenees are also inferior to those of the North, having but a small quantity of resinous substance in them, which soon evaporates;§ and, from the difference of the soil, they are very variable in quality; many, however, are of a fine grain and possess considerable strength and elasticity, until they become dry. Those from Corsica, *pinus halepensis*, of which species many grow on the Mediterranean side of France, Spain, Italy, Asia Minor, and Barbary, and likewise some on the south-east of France, have more resin in them, and are harder and considerably better than those from the Pyrenees.

The Turks obtain excellent firs from the shores of the Black Sea, from the Bosphorus to Sinope; they are commonly of the species denominated *pinus pinea*, and *pinus laricis*; they are of better quality than is common to these species, and are little inferior to those of the North. These trees are plentiful near the Olympus, and in the interior of Asia Minor; the stem is straight, and grows to a considerable height and size. The Turks use them not only in masting, but likewise in the construction of the hulls of ships.*

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* The firs from the Alps appear commonly more suited for joiners' work than for masting. The principal tree is the *pinus cambra*, which is described by Mr. Harte, in his "Essays on Husbandry," under the title of *Aphernousli Pine*.

† In 1758, a company was formed at Bern, for the purpose of conveying mast timber from the Pyrenees to the regular carriage roads; and in 1765, the king of France, to lessen his dependence on the northern states for supplies of the different firs, sent proper Officers to undertake the conveying of timber from the Pyrenees to the depôt at Bayonne; the principal direction of this great undertaking was entrusted to M. Le Roy, an Engineer of the Royal Dock-yards; and, according to his own memorial, he appears, in prosecuting this vast undertaking, to have cut through rocks in many parts to the extent of four or five thousand toises, to get at the proper places for forming the declivity at the height of nearly 1800 feet above the plains. In some places bridges were thrown over ravines 50 toises broad; and different causeways formed, with a proper inclination, and sufficiently wide to turn the longest tree at the different windings.

‡ See "Des Bois propres au service des arsenaux de la Marine et de la Guerre" (par P. E. Herbin de Halle, chap. i., page 13); "Instruction sur les Bois de Marine" (Art. 115, page 164), and "Encyclopedie Methodique Marine." (Tom. i., page 163.)

§ The pines that grow in cold countries are superior, from the quantity of resin they contain, as it congeals by cold and attenuates by heat, and more readily evaporates.

On Selecting Firs.

In selecting firs for masting, the climate, aspect, and soil in which they grow, are to be considered. The state of the tree, when standing, may be known in a great measure from the luxuriance of its upper branches; if they are dead, or do not appear flourishing, the tree may likewise be considered on the decay.

To judge of the qualities of the trees while standing belongs more immediately to those employed in the forests; while the mast-maker is left only to make his choice of the trees when felled, and whose attention is drawn to their appearance only as timber.

To be able to judge readily of the different kinds and qualities of fir timber, considerable practice and close observation are required, as well as a general acquaintance with the appearances which distinguish these qualities. The firs most desirable are those with a fine and close grain, in which the ligneous layers are the least separated, and the annual and concentric circles fine and firmly connected, decreasing gradually from the heart to the sap.† The nearer the concentric layers are to circles or ellipses, the less likely is the timber to be defective, as sudden swells are very frequently caused by rind-galls. They are also generally strongly charged with resin, which is not only beneficial in giving strength and elasticity, but it preserves the timber from insects, and prevents fermentation and decay.‡ The colour should be of a clear or bright yellow, with a reddish cast alternately. The smell in the Riga, and other firs of this quality, should be strongly resinous, especially when they are exposed to the sun, or any other heat, or when their shavings are rubbed between the fingers. On the contrary, when the layers are separate, porous, or open, with tints of pale red near the heart, and white spots intermixed, or of a dark red, with the resinous particles of a blackish colour, the timber is in a state of decay. Likewise, when the firs are cut transversely, and are not of a uniform colour, but interspersed with veins, and the smell is either entirely gone or become fetid, they may be considered past their prime, and approaching to a state of decay. In yellow and red pines that have not the strong resinous smell, the degree of unsoundness is denoted by the offensiveness of the smell; and they will, in common with other firs, have alternate layers of a foxy brown or red colour, and will break out before the sharpest plane in being wrought.*

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* See Pocock's Travels, vol. ii., table 86.

† It is the uniformity and closeness of the ligneous rings, as well as the quantity of resin, that show the superiority in different firs, as by the compactness of the layers they are not only rendered stronger, but have greater degrees of elasticity.

‡ See "Du Transport, de la conversation, et de la force des Bois; par Du Hamel." (Chap. ii.)

The experienced mast-maker forms his opinion of the quality of a stick, not only from the colour, smell, and appearance of the grain, but by its working; for as a stick is more or less frough or fragile, the greater or less difficulty he has in separating its parts, as he chops them off. If the timber is good, its parts, on being separated, appear stringy, and oppose a strong adhesion; and the shavings from the plane will bear to be twisted two or three times round the fingers: whereas, if the stick is of a bad quality, or in a state of decay, and has lost its resinous substances, the chips and shavings come off short and brittle, and with much greater ease.

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* Herbin de Halle, in his work, "Des Bois propres au Service de la Marine et de la Guerre," says, If, amongst firs, we prefer those of the North, it is because they are considered to combine the necessary strength, with a suitable degree of flexibility, and have their pores filled with a resinous gum, which is distinguished by the agreeable odour it gives out. The grain of a tree being close, shows the multiplicity of its fibres, and the quantity of resin it contains seems to warrant both its suppleness and the durability of its strength. Moist and marshy soils only produce trees which are dry and of a bad quality; whilst, on the contrary, trees grown upon dark soils, mixed with stone and gravel, are well nourished, without being weakened by a superfluity of branches.

Firs for the masts and yards of ships ought to have the following qualities:

1st. The wood should be of a clear yellow, and not white; as this colour indicates that it is more resinous.

2nd. The grain should be fine and close, the heaviest wood of each species being the most esteemed.

3rd. The concentric circles in the body of the tree should not be too thick; they should be alternately of a brilliant and dark yellow, and full of resin.

4th. When stripped of its bark, a resinous juice of a pleasant smell ought to exude from all parts, if it remain exposed to the sun.

5th. If the tree is of a dark red, and the resinous juice is of a blackish colour, it shows an incipient decay.

6th. The fir should have attained a proper age before it can be considered in perfection: young trees have too much sap.

7th. The colour of the wood should be uniform; if, when cut, it shows veins or varieties of colours, it is not good.

8th. It should have neither shakes nor rind-galls, nor too great a number of knots; attention must likewise be paid, to see that it is not rotten. To hide rottenness, the merchants will make a knot appear very sound with hot resin, which it is difficult to discover.

On the relative Strength and Flexibility of Mast Timber, &c.

The following experiments were made by the writer, to ascertain the principal relative qualities of timber used for the masts of ships. The experiments were made on a larger scale than usual; so that small defects, to which they are always liable, could not greatly affect the results. They were also conducted with great attention and care.

TABLE I.

Experiments on Pieces three inches square, and two feet long, beyond the Support fixed at one End; Weights acting at two feet.

Distinguishing Number.	SPECIES OF TIMBER.	Deflection.				Weight with which the pieces broke.			Specific gravity.	REMARKS.
		with 5cwt.	with 10 cwt.	with 12½ cwt.	with 15 cwt.					
		ins.	ins.	ins.	ins.	cwt.	qrs.	lbs.	oz.	
1	Riga, top	.52	1.02	2.07	3.1	16	2	0	605	All the specimens in these experiments were dry.
2	butt	.4	.8	1.5	2.87	18	3	0	668	
3		.37	1.0	1.37	1.62	16	1	0	821	
4	Red pine, top	.63	1.42	2.68		14	2	6	544	
5	butt	.6	1.07	1.95		16	3	1	634	
6	American spruce, top	.56	1.32	2.13		13	2	6	504	
7	butt	.5	.9	1.67		15	3	22	570	
8	Norway spruce, top ..	.55	1.04			12	0	26	464	The butts of these specimens were tough.
9	butt .	.62	1.35	1.97	3.0	16	2	12	506	
10	Adriatic, top	.5	1.0	2.0		12	3	26	467	
11	butt	.4	.7	1.4		15	1	8	493	
12	Yellow, pine, top	.62	2.0			11	1	0	406	
13	butt .	.63	2.12			12	1	18	493	
14	Scotch spruce, top ..	.58				9	3	16	389	
15	butt ..	.54	2.0			10	3	26	440	The heart of poon, in all cases, was considerably weaker in proportion to the outside, than any of the other experiments.
16	Cowdie, top	.37	.75	1.12	1.62	17	2	0	626	
17	butt	.5	.87	1.25	1.87	18	3	0	632	
18	Poon, top, outside ..	.46	.62	.9	1.4	18	2	14	654	
19	heart	.62				9	3	18	608	
20	butt, outside ..	.37	.75	1.0	1.25	20	3	14	666	
21	heart ...	.57	.8			10	3	24	646	

TABLE II.—*Experiments on Pieces three inches square, supported on two Props at four feet distance; Weights acting at the Middle.*

Distinguishing Number.	SPECIES OF TIMBER.	Deflection with 15 cwt.	What it recovered by its resilience when the weight was removed.	Deflection with 22½ cwt.	What it recovered by its resilience when the weight was removed.	Deflection after one hour's pressure with 22½ cwt.	What it recovered by its resilience when the weight was removed.	Weight with which the pieces broke.			Specific gravity.	REMARKS.
		ins.	ins.	ins.	ins.	ins.	ins.	cwt.	qr.	lb.		
1	Riga, top	.31	.29	.62	.59	.97	.91	32	2	14	664	All the pieces in these experiments were green.
2	butt..........	.25	.22	.53	.5	.85	.73	35	1	10	720	
3	Red pine, top	.81	.68	1.37	1.13	1.4	1.1	23	1	6	627	Most of these pieces broke off after the pressure had continued about five minutes.
4	butt......	.63	.59	.95	.91	1.2	1.05	28	3	24	712	
5	American spruce, top	.37	.36	.62	.6	1.87	.95	21	1	26	598	
6	butt	.31	.29	.63	.61	1.07	.95	23	2	14	643	
7	Norway spruce, top	.57	.50	.82	.8	1.37	.93	21	2	0	572	
8	butt	.58	.56	.84	.82	1.37	.95	23	1	14	595	
9	Adriatic, top	.30	.29	.42	.4			21	1	6	532	
10	butt	.29	.27	.43	.41	.65	.45	23	0	16	582	
11	Yellow pine, top	.89	.77	1.48	1.1			21	2	0	553	
12	butt ..	.73	.6	1.0	.9			23	3	26	661	
13	Scotch spruce, top ..	.84	.83					18	2	0	478	
14	butt	.72	.7					19	2	6	542	
15	Cowdie, top	.31	.3	.43	.41	.62	.54	35	2	7	626	
16	butt	.31	.3	.43	.41	.62	.54	36	0	0	643	

TABLE III.—*Experiments on Pieces three inches square, supported on two Props, four feet distance; Weights acting at the Middle.*

Distinguishing Number.	SPECIES OF TIMBER.	Deflection with 15 cwt.	What it recovered by its resilience when the weight was removed.	Deflection with 22½ cwt.	What it recovered by its resilience when the weight was removed.	Deflection after one hour's pressure.	What it recovered by its resilience when the weight was removed.	Weight with which the pieces broke.			Specific gravity.	REMARKS.
		ins.	ins.	ins.	ins.	ins.	ins.	cwt.	qrs.	lb.		
1	Riga, top	.5	.48	.93	.87	1.01	.97	32	1	4	516	All the pieces in these experiments were dry.
2	butt........	.31	.3	.62	.56	.97	.86	34	1	14	633	
3	Canada red pine, top ..	.56	.51	1.25	1.13	1.37	1.2	23	0	0	514	
4	butt..	.42	.40	.62	.56	.69	.6	25	0	0	644	
5	American spruce, top..	.47	.38	.91	.87	1.08	.97	22	2	26	488	
6	butt	.47	.35	.82	.78	1.06	.94	22	3	1	546	
7	Norway spruce, top ..	.51	.49	.83	.81			21	0	14	464	Very good specimens.
8	butt..	.57	.56	.84	.8	1.0	.81	23	0	14	506	
9	Adriatic, top..........	.27	.25					21	0	26	443	
10	butt	.25	.23					22	1	23	462	
11	Yellow pine, top......	.6	.48					21	1	0	395	
12	butt	.66	.5	.99	.67	1.6	1.21	23	2	0	142	
13	Scotch spruce, top	.75	.72					15	2	14	348	
14	butt ..	.62	.61					17	2	0	142	
15	Cowdie, top	.56	.56	.68	.64	7.5	.67	32	1	0	560	
16	butt	.27	.27	.43	.43	.5	.48	35	1	0	582	
17	Poon, top	.32	.32	.61	.6	.64	.62	35	2	14	632	
18	butt	.25	.25	.56	.56	.62	.61	37	1	8	658	
19	Scotch larch, top......	.75	.69	1.25	1.1	2.0	1.5	26	1	0	530	
20	red larch, butt..	1.25	1.1	2.75	1.75	—	—	22	2	0	560	Broke before the hour.
21	top ..	.79	.76	1.36	1.1	—	—	22	2	0	520	
22	white larch, butt	1.27	1.65	2.9	1.92	—	—	22	2	0	527	
23	Virginia red pine, top..	.36	.54	.9	.6	1.25	1.0	26	3	0	540	
24	butt	.41	.40	.7	.6	.77	.6	33	1	0	640	

TABLE IV.

Experiments on Pieces three inches square, supported on two Props, four feet distance; Weights acting at the Middle.

Distinguishing Number.	SPECIES OF TIMBER.	Deflection with 15 cwt.	What it recovered by its resilience when the weight was removed.	Deflection with 22½ cwt.	What it recovered by its resilience when the weight was removed.	Deflection after one hour's pressure.	What it recovered by its resilience when the weight was removed.	Weight with which the pieces broke.			Specific gravity.	REMARKS.
		ins.	ins.	ins.	ins.	ins.	ins.	cwt.	qrs.	lbs.		
1	Riga	.25	.25	.37	.33	.4	.33	40	1	22	610	All the pieces in these experiments were very dry, and were particularly good specimens.
2	Red pine	.36	.35	.68	.62	.86	.78	33	3	0	544	
3	Yellow pine	.37	. 3	.78	.72	1.0	.82	24	2	12	439	
4	Norway spruce ..	.31	. 3	.61	.6	.86	.63	29	1	16	517	Broke after the pressure had continued 15 minutes.
5	Scotch pine	.62	. 6	.93	.9			22	2	0	453	
6	Cowdie	.29	.29	.46	.44	.5	.45	36	2	22	579	

TABLE V.

Specific Gravity, relative Strength, Flexibility, and Resilience, of the different Timber used in Mast-making.

Distinguishing Number.	SPECIES OF TIMBER.	Mean specific gravity. Green.	RELATIVE.			Mean specific gravity. Dry.
			Strength.	Deflection.	Resilience.	
1	Riga, top	682	1000	1000	1000	576
2	butt	754				656
3	Red pine top	647	853	1500	980	544
4	butt	741				638
5	American spruce, top....	627	764	1100	905	541
6	butt ..	678				582
7	Norway spruce, top	595	740	1260	860	509
8	butt	616				520
9	Adriatic, top	552	709	864	872	467
10	butt	585				493
11	Yellow pine, top	562	746	1520	750	430
12	butt	665				472
13	Scotch spruce, top	475	476	1450	1100	389
14	butt......	536				440
15	Cowdie, top	604	974	920	1086	571
16	butt	663				619
17	Poon, top	—	1226	978	1146	632
18	butt	—				662
19	Scotch larch, top	582	810	1500	905	528
20	red larch, butt....	620	710	1620	842	554
21	white larch, top ..	571	756	1545	835	527
22	butt..	602	756	1652	821	536
23	Virginia red pine, top....	620	826	1200	960	562
24	butt ..	704	937	1130	1000	656

TABLE VI.

Experiments on Pieces of Timber three inches square, and four feet six inches long; the Supports placed three inches from each End, and the Weight acting at the Middle.

SPECIES OF TIMBER.	Deflection.				Weight with which the pieces broke.			Position of the Felt.	Specific gravity.	REMARKS.
	with 18 cwt.	with 27 cwt.	with 36 cwt.	with 38½ cwt.						
	ins.	ins.	ins.	ins.	cwt.	qrs.	lbs.			
Hackmatack, butt, No. 1..	.5	.75	1.0	1.25	42	2	1	vertical	800	All the specimens used in these experiments were dry and free from sap.
top	.62	.87	1.25	1.4	41	1	24	vertical	657	
butt, No. 2..	.62	.87	1.5		37	0	14	horizontal	687	
top	.62	1.0			30	2	22	horizontal	687	
Scotch larch, butt, No. 1....	.5				27	0	0	vertical	544	
top..........					17	1	21	vertical	504	
butt, No. 2....	.62	1.12	2.0		36	0	0	horizontal	604	
top	.62				18	0	18	horizontal	593	
Polish larch, butt, No. 1...	.62	1.0	1.62		37	0	14	vertical	771	
top	.62	.87	1.25		39	2	22	vertical	657	
butt, No. 2. ..	.5	.87			33	3	0	horizontal	654	
top	.75				27	0	0	horizontal	597	
Italian larch, butt, No. 1...	.75	1.06	1.5		37	1	13	vertical	675	
top	.5	.62	1.0	1.5	44	1	21	vertical	640	
butt, No. 2...	.4	.62	.81	1.0	45	0	0	horizontal	664	
top	.62	.87	.15		36	2	7	horizontal	615	
butt, No. 3. ..	.75	1.62			30	3	12	vertical	657	
top	.62	1.0			33	3	0	vertical	600	
	with 9 cwt.	with 18 cwt.	with 22½ cwt.	with 27 cwt.						
Cuba cedar, butt, No. 1....	.5	.75	.87		26	3	1	vertical	494	
top..	.5	.75			19	0	14	vertical	495	
butt, No. 2.....	.27	.75	1.0		26	0	22	horizontal	568	
top..........	.5	1.0	1.25		25	1	7	horizontal	547	
New S.W. cedar, butt, No. 1	.37	.62	.75	1.12	29	2	26	horizontal	494	
top	.31	.62	.81	1.25	28	1	22	vertical	512	
butt, No. 2.	.37	.62	1.0	1.12	30	0	6	vertical	622	
top	.37	.75	1.12		25	1	7	horizontal	593	

The results inserted in these Tables are not taken from single experiments, but are the mean results of numerous experiments on the same kinds of timber. The defects common to experiments on specimens of timber, caused by the crossing of the range of fibres, or from the fibres not firmly adhering, render it necessary not only to make the experiments on large specimens, but on a great number of them, and that the pieces should be cut from different trees. For, in the experiments that were made, a piece of Riga well charged with resin, the specific gravity 821, was found to bear only 16 cwt.; whereas a piece of yellow pine, of the same length and size, with its specific gravity 504, was found to bear 25 cwt.; a piece of red pine, also, with a specific gravity 527, was found to bear only 18 cwt.; while a piece of Scotch spruce, the specific gravity of which was only 450, was found to bear only 25 cwt. Now, if a comparison had been drawn from these results,—since the experiments were good, and the pieces, to appearance, equally good,—the conclusion would have been, that the yellow pine was far superior, in respect to strength, to the Riga, and the Scotch spruce to the red pine; and the same for all the other species of wood upon which the experiments were made. A like error may likewise be fallen into, on the contrary side, in determining the relative strength by a single experiment; since a piece of Riga was found to bear 42 cwt., while a piece of yellow pine was found to bear only 12 cwt.; and a piece of red pine 33 cwt., while a piece of Scotch spruce was found to bear 9 cwt. To have taken therefore these results for their relative strength, or the extreme for the mean strength, would have given results contrary to what a greater number of experiments has determined; for we find the mean weight that Riga will bear lies between 32 and 36 cwt.; yellow pine between 24 and 26 cwt.; red pine between 26 and 30 cwt; and Scotch spruce between 13 and 17 cwt.

From these inequalities in timber, the same incorrect conclusions, without repeated experiments, would likewise be drawn in determining the specific gravity, relative deflection, and elasticity of the different timbers.

In Table V., the different timbers are placed with their relative qualities, taking the Riga at 1000; the qualities are not deduced altogether from the experiments given in the preceding Tables, but from a regular series, to determine the mean, without taking into account the extremes that, as before-stated, are to be found in most kinds of timber.

Those kinds of timber that have little or no resin, and whose colour is of a whitish or light-brown cast, and are of a rather coarse grain, (as the Adriatic, Norway, &c.,) will, as they become very dry, though they maintain their elasticity and strength for a considerable time, become so rigid that they will be always subject to break by any sudden impulses, without warning, especially if they are kept in dry stores for a long time.

The Riga and other timbers containing a proper quantity of resin, and the red pine, from the fineness and closeness of its grain, and the adhesiveness of its fibre, not only maintain their elasticity, but strength and flexibility, much longer, even to a very dry state.

The cowdie possesses advantages over most other timbers, from the firmness of its grain, and the uniformity of its texture. In all the experiments made upon its strength, both dry and green, it was commonly found to bear 36 cwt., and never to bear less than 30 cwt.; while, at the same time, the heart appeared equally strong with the outside.

The experiments that have been made on this timber, compared with the Riga, Dantzic, and other esteemed firs, justify a conclusion that it possesses qualities equally good with those timbers, for all the purposes for which they are generally used. The cowdie, by being exposed to the weather, appears less liable to shrink than others, and stands equally well with them. A piece half an inch thick, and about a foot wide, with a wind shock extending part of the way up from one end, was exposed to the vicissitudes of the weather, for more than eighteen months; after that period it was not shaken, and had undergone no other alteration than the disappearing of the sap that was on it, to some distance from one edge, leavingit with the firmness and colour of the wood fully elaborated. Most of the cowdie spars that have been brought to England appear but a little beyond saplings, since many of the full-grown trees are said to exceed 30 feet in girth, and to continue the full size to nearly 60 feet from the ground. Their common diameter is from 3 to 6 feet, and their length frequently from 90 to 100 feet, clear of branches.

From the experiments that have been made on the different kinds of timber employed in mast-making, the results of which are confirmed by experience in the use of them, a fair conclusion may be drawn, that timber whose specific gravity does not exceed that of the Riga, and whose strength, tried on pieces of the same dimensions, and under the same circumstances as those in the foregoing experiments, which is found capable of bearing 24 cwt. with its flexibility and elasticity, within the limits of the results in these Tables, may be considered suitable for the purposes of mast-making, as far as respects these qualities; while its durability may be judged of by close observation on the texture of its fibres, the uniformity of growth, and by the quantity and state of the resinous substances it contains.

On Preserving Store Timber for Masting.

To preserve a store of mast timber, various methods have been used. Most kinds of fir timber for masting require the same means to be used for their preservation; but timbers of different qualities require different degrees of attention. Timber that is hard and fine grained, or that contains a great quantity of resin, will preserve its strength longer in dry sheds than when it is exposed to the vicissitudes of the weather. On the contrary, timber which contains little resin, as the Norway spruce, and the timber obtained from Canada and Scotland, &c., or that from which the proper juice soon evaporates, require to be constantly under water, or sheltered from the influence of variable atmospheres. For in this kind of timber, constant changes of temperature produce more readily, and in a greater degree than in any other, the alternate motion of the fibre, which not only assists the evaporation of those particles which constitute the adhesiveness of its fibre, and the essential principle of its strength, but produce fermentation and destroy its durability.

The small Norway spars, such as the cant, barling, boom, middling, &c., require to be stripped of their rind or bark, and to be kept in dry sheds, not too hot; for these spars, if kept in water, would, from their smallness, imbibe too much of the fluid, which would make them rough or fragile.

The means generally used to preserve timber for masting, is to submerge the sticks under water in locks, or bury them in sand or mud* on the sea-shore, though it is not uncommon to let them float, and to turn them occasionally. This latter method cannot be good, since the side exposed to the rays of the sun will soon deteriorate; for, by the sudden decomposition of its adhesive substance, and the contraction of its fibres, it becomes full of small rents, which, on being immersed, imbibe more water, and cause the fibre to distend. The timber having been thus repeatedly turned, and its fibre alternately distended and contracted, its adhesive substance is, by means of disruption and evaporation, at length carried off, and its strength greatly impaired. When the timber is wholly immersed in mud or water, it is exposed to the least variable element, and consequently subjected to the least change; hence that constant rarefaction and condensation, or "motion of the fibre," which destroy solidity and cause decay are prevented.

To bury fir timber in mud appears, from long experience, to be best suited for its preservation; but with large and light sticks, as yellow pine, bowsprits, &c., there is some difficulty in keeping them down by the weight of mud, especially after it has been once disturbed; for which reason locks are constructed in some of the royal dock-yards, between brick or stone piers, to keep them constantly under water, and to contain several heights, so as to have them separate, according to their specifications.

Du Hamel informs us, that it was the constant practice at Brest to bury all fir timber for mast purposes in mud; and that, when the weight of mud was not sufficient to keep them down, piles were driven in rows on each side of different tiers of sticks, and pieces fixed across them to prevent their rising; that, at Toulon, they were kept down by punts filled with stone, and sunk upon them; and that at Rochfort, channels, or moats, were dug just below high-water mark at spring tides, and piles driven on each side to take three masts abreast between them, with cross-pieces or chains attached to them to keep them down. Since it appears, as well from the experience in our own dock-yards, as from the testimony of the French and other nations, that the best means to preserve a store of mast timber, is to bury it in mud, or to keep it wholly under water, the mode of executing it can present but little difficulty, as various may be the plans for performing it; but it will appear that it must depend, in a great measure, on circumstances connected with the place where the timber is to be preserved.

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* Du Hamel gives an account of a number of experiments made at Rochfort, in which it was proved that the burying of fir timber in mud destroyed the worm; he likewise considers, that to keep mast timber in salt water is better than fresh, as it keeps longer moist, and preserves it supple.

On the Specification of Mast Timber.

Mast timber is received into the royal dock-yards under certain specifications; as inch-masts, and hand-masts. Inch-masts are hewn square, and are taken according to the number of inches they measure in diameter; hand-masts are taken in their round state, according to the number of hands they measure in circumference; those which measure less than six hands, are termed *spars;* those from six to five hands, *cant-spars;* from five to four, *barling;* from four to three, *boom;* from three to two, *middling;* and from two to one, *small spars.* They are likewise received under certain terms, as agreed upon by contract.

On Receiving and Surveying Mast Timber.

Previous to the different sticks being received, they are examined by the timber receiver, and master mast-maker, to see that they are, according to the terms of contract, of suitable quality, and free from any considerable defects or bends. In examining the qualities and defects of mast timber, all rind-galls and rotten places are bored into and laid open, and the butts and knots well inspected. If on spotting over the butts they appear shaken, or not of a good colour, or on the decay, small portions of them are sawn off, until the defect disappears, or its extent is ascertained; and if any of the knots have the least suspicious appearance, they are struck with a mallet, or maul, to see that they are not merely plugs, or artificial knots, that have been put in with hot resin, to supply the place of bad knots that have been bored out. The stick is further examined, to see that there are no knots below the tongue of any consequence; that they are well collared;* and likewise that there are no sudden bites, or bends, which would render it unfit for service.

Sticks intended for inch-masts, yards, &c., have their lengths, and other elements, determined by the size of the partners, bed, slings, &c.† The tongue is not to be more than one-third of the whole length; and as much as the masts are deficient in the length of the head, in a corresponding proportion must the tongue be shorter. And a reduction is made at a price per foot, varying according to the size the reduced length would give. If at the heel it is more than four feet short of the contract length, it is not received.

When the measuring places of inch-masts, yards, &c., are set off, the stick is dubbed four ways, till spine appears, at which it is measured; and the smallest diameter taken for the size at each place.

Hand-masts are received in their round state, and have their circumferences given in hands, according to their length, and at given distances.

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* Knots are badly collared, when the fibres that take the sinuous forms round them are not compact, but separate.

† See Tables I., II., III., IV., and V.

TABLES :—*Showing the Diameters, Proportions, and Situations of the Measuring Places; according to the Lengths of Sticks for Masts, Bowsprits, and Yards.*

TABLE I.—*Mast Timber.*

NORTH AMERICAN STICKS FOR BOWSPRITS.*

Diameter in inches at the outer bed.	Length in feet.	Distance from the heel to the bed.				Distance between the quarters.		Length of the head.		Diameters at the heel, end, quarters, expressed in fractions of the diameter at the bed.				
		Inside the bed, 1/7 the length.		Outside the bed, 3/8 the length.				Three times the diameter of the bed.		Heel.	Quarters.			End.
											1	2	3	
										5/6	44/45	13/14	7/9	6/11
inches	feet	feet	ins.	feet	ins.	feet	ins.	feet	ins.	ins.	ins.	ins.	ins.	ins.
39	75	10	8½	28	1½	11	8⅝	9	9	32½	38⅛	36⅛	30⅜	21¼
38½	75	10	8½	28	1½	11	8⅝	9	7½	32	37⅝	35¾	29⅞	21
38	75	10	8½	28	1½	11	8⅝	9	6	31⅝	37⅛	35¼	29½	20¾
37½	73½	10	6	27	7	11	5¾	9	4½	31¼	36⅝	34¾	29⅛	20⅜
37	75	10	8½	28	1½	11	8⅝	9	3	30¾	36⅛	34⅜	28¾	20½
36½	73½	10	6	27	7	11	5¾	9	1½	30⅜	35⅝	33⅞	28⅜	19⅞
36	72	10	3⅜	27	0	11	3	9	0	30	35⅛	33⅜	28	19⅝
35½	71¼	10	2	26	8	11	1⅝	8	10½	29½	34¾	32⅞	27½	19⅜
35	70½	10	1	26	5	11	0¼	8	9	29⅛	34⅛	32½	27⅛	19
34½	69¾	9	11½	26	2	10	10¾	8	7½	28¾	33¾	32	26⅞	18¾
34	69	9	10¼	25	10½	10	9⅜	8	6	28¼	33¼	31½	26⅜	18½
33½	68¼	9	9	25	7	10	8	8	4½	27⅞	32¾	31	26	18¼
33	67½	9	7¾	25	3¾	10	6½	8	3	27½	32½	30½	25⅝	18
32½	66½	9	6⅜	25	0⅜	10	4⅝	8	1½	27	31¾	30	25¼	17¾
32	65½	9	4½	24	9	10	2¼	8	0	26⅝	31¼	29⅝	24⅞	17⅜
31½	64½	9	2⅝	24	2¼	10	0⅞	7	10½	26¼	30¾	29¼	24½	17⅛
31	63	9	10	23	7½	9	10⅛	7	9	25¾	30¼	28¾	24	16⅞
30½	62¼	8	0¼	23	4⅛	9	8⅝	7	7½	25⅜	29¾	28¼	23¾	16⅝
30	61½	8	8⅝	23	0¾	9	7¼	7	6	25	29⅜	27¾	23⅜	16⅜
29½	60	8	6⅞	22	6	9	4½	7	4½	24½	28¾	27⅜	22⅞	16
29	58½	8	4¼	21	11¼	9	1⅞	7	3	24⅛	28¼	26⅞	22½	15¾
28½	57¾	8	3	21	7⅞	9	0¼	7	1½	23¾	27¾	26½	22⅜	15½
28	57	8	1¾	21	4½	8	10⅞	7	0	23¼	27⅜	26	21¾	15¼
27½	55¾	8	0	20	11¼	8	7⅞	6	10½	22⅞	26⅞	25⅜	21⅜	15
27	54	7	9¾	20	6¼	8	4⅞	6	9	22½	26⅜	25	21	14¾
26½	53¼	7	8	20	1	8	3⅜	6	7½	22	25⅞	24½	20⅝	14½
26	52½	7	6	19	8	8	2½	6	6	21⅝	25⅜	24⅛	20¼	14⅛
25½	51¾	7	4⅝	19	5	8	1	6	4½	21¼	24⅞	23⅝	19¾	13⅞
25	51	7	3⅜	19	1½	7	11⅜	6	3	20¾	24⅜	23¼	19⅜	13⅝
24½	50¾	7	2⅝	18	10⅜	7	10⅛	6	1½	20⅜	23⅞	22¾	19	13⅜
24	49½	7	0⅞	18	6¼	7	8¾	6	0	20	23⅜	22¼	18⅝	13
23½	48¾	6	11½	18	3⅜	7	7⅜	5	10½	19½	22⅞	21¾	18¼	12⅞
23	48	6	10¼	18	0	7	6	5	9	19⅛	22⅜	21⅜	17⅞	12½
22½	47¼	6	9	17	8⅜	7	4⅝	5	7½	18¾	22	20⅞	17½	12¼
22	46½	6	7¾	17	5¼	7	3⅜	5	6	18¼	21½	20⅜	17	12
21½	45¾	6	6⅜	17	1⅞	7	1¾	5	4½	17⅞	21	19⅞	16⅝	11¾
21	45	6	5⅛	16	10½	7	0⅜	5	3	17½	20½	19½	16¼	11⅜
20½	44¼	6	3⅞	16	7⅞	6	11	5	1½	17	20	19	15⅞	11⅛
20	43½	6	2½	16	3¾	6	9½	5	0	16⅝	19½	18½	15½	10⅞
19½	42¾	6	1	16	0⅜	6	8¼	4	10½	16¼	19⅛	18	15⅛	10⅝
19	42	6	0	15	9	6	6¾	4	9	15¾	18½	17⅝	14¾	10⅜
18½	41¼	5	10¾	15	6	6	5¼	4	7½	15¾	18	17⅛	14⅜	10
18	40½	5	9½	15	2¼	6	4	4	6	15	17½	16⅝	14	9¾

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* In consequence of the increased dimensions of Bowsprits, the following proportions are now commonly introduced in the receipt of Sticks :

End.............. 5/8 of the Bed.
3rd Quarter .... 7/8 of the Bed.
2nd Quarter .... 10/11 of the Bed.
1st Quarter .... 40/41 of the Bed.
Heel .... 5/6 of the Bed.

TABLE II.—*Mast Timber.*

NORTH AMERICAN MASTS.*

Diameters at the partners in inches.	Length in feet.	Distance of the upper partners from the heel.		Length of the quarters.		Length of the Head.		Length of the Tongue.	Diameter at the Heel.	Diameter at the Quarters.			Diameter at the Hounds.	Diameter at the Head.
		5-18 the whole length.				4¾ inches to a yard.		One 3d the len.		1	2	3		
									15/16	60/61	15/16	11/13	9/13	4/7
inches.	feet.	ft.	ins.	ft.	ins.	ft.	ins.	feet.	inches.	inches.	inches.	inches.	inches.	inches.
38	123	34	2	18	3⅜	16	2¾	41	35⅝	37⅜	35⅝	32⅛	26¼	21⅝
37½	121½	33	9	17	11⅛	16	0⅜	40½	35⅛	36⅞	35⅛	31⅝	25⅞	21⅜
37	120	33	4	17	8¼	15	10	40	34⅝	36⅜	34⅝	31¼	25½	21⅛
36½	118½	32	11	17	5⅞	15	7⅝	39½	34⅛	35⅞	34⅛	30⅞	25¼	20¾
36	117	32	6	17	3⅛	15	5¼	39	33¾	35⅜	33¾	30⅜	24⅞	20½
35½	115½	32	1	17	0½	15	2⅞	38½	33¼	34⅞	33¼	30	24½	20¼
35	114	31	8	16	9⅞	15	0½	38	32¾	34⅜	32¾	29½	24⅛	20
34½	112½	31	3	16	7¼	14	10⅛	37½	32¼	33⅞	32¼	29⅛	23⅞	19⅝
34	111	30	10	16	4½	14	7¾	37	31⅞	33⅜	31⅞	28¾	23½	19⅜
33½	109½	30	5	16	1⅞	14	5⅜	36½	31⅜	33	31⅜	28¼	23⅛	19⅛
33	108	30	0	15	11¼	14	3	36	30⅞	32½	30⅞	27⅞	22¾	18¾
32½	106½	29	7	15	8⅝	14	0⅝	35½	30⅜	32	30⅜	27½	22⅜	18½
32	105	29	2	15	5⅞	13	10¼	35	30	31½	30	27	22⅛	18¼
31½	103½	28	9	15	3¼	13	7⅞	34½	29½	31	29½	26⅝	21⅞	18
31	102	28	4	15	0⅝	13	5½	34	29	30½	29	26⅛	21⅜	17⅝
30½	100½	27	11	14	10½	13	3⅛	33½	28½	30	28½	25¾	21	17⅜
30	99	27	6	14	7¼	13	0¾	33	28⅛	29½	28⅛	25⅜	20¾	17⅛
29½	97½	27	1	14	4⅝	12	10⅜	32½	27⅝	29	27⅝	24⅞	20⅜	16¾
29	96	26	8	14	2	12	8	32	27⅛	28½	27⅛	24½	20⅛	16½
28½	94½	26	3	13	11⅜	12	5⅝	31½	26⅝	28	26⅝	24	19⅝	16¼
28	93	25	10	13	8⅝	12	3¼	31	26¼	27½	26¼	23⅝	19⅜	16
27½	91½	25	5	13	6	12	0⅞	30½	25¾	27	25¾	23¼	19	15⅝
27	90	25	0	13	3⅜	11	10½	30	25¼	26½	25¼	22¾	18⅝	15⅜
26½	88½	24	7	13	0¾	11	8⅛	29½	24¾	26	24¾	22⅜	18¼	15⅛
26	87	24	2	12	10	11	5¾	29	24⅜	25½	24⅜	22	18	14¾
25½	85½	23	9	12	7⅜	11	3⅜	28½	23⅞	25	23⅞	21½	17⅝	14½
25	84	23	4	12	4¾	11	1	28	23⅜	24½	22¾	21⅛	17¼	14¼
24½	82½	22	11	12	2	10	10⅝	27½	22⅞	24	22⅞	20⅝	16⅞	14
24	81	22	6	11	11⅜	10	8¼	27	22½	23½	22½	20¼	16½	13⅝
23½	79½	22	1	11	8¾	10	5⅞	26½	22	23⅛	22	19⅞	16¼	13⅜
23	78	21	8	11	6⅛	10	3½	26	21½	22⅝	21½	19⅜	15⅞	13⅛
22½	76½	21	3	11	3½	10	1⅛	25½	21	22⅛	21	19	15½	12¾
22	75	20	10	11	0¾	9	10¾	25	20⅝	21⅝	20⅝	18½	15⅛	12½
21½	73½	20	5	10	10⅛	9	10⅜	24½	20⅛	21⅛	20⅛	18⅛	14⅞	12¼
21	72	20	0	10	7½	9	6	24	19⅝	20⅝	19⅝	17¾	14½	12
20½	70½	19	7	10	5	9	3⅝	23½	19⅛	20⅛	19⅛	17¼	14⅛	11⅝
20	69	19	2	10	2¾	9	1¼	23	18¾	19⅝	18¾	16⅞	13¾	11⅜
19½	67½	18	9	9	11½	8	10⅞	22½	18¼	19⅛	18¼	16½	13½	11⅛
19	66	18	4	9	8⅞	8	8½	22	17¾	18⅝	17¾	16	13⅛	10¾
18½	64½	17	11	9	6¼	8	6⅛	21½	17¼	18⅛	17¼	15⅝	12¾	10½
18	63	17	6	9	3½	8	3¾	21	16⅞	17⅝	16⅞	15⅛	12⅜	10¼
17½	61½	17	1	9	0⅞	8	1⅜	20½	16⅜	17¼	16⅜	14¾	12⅛	10
17	60	16	8	8	10¼	7	11	20	15⅞	16¾	15⅞	14⅜	11¾	9¾
16½	58½	16	3	8	7⅝	7	8⅝	19½	15½	16¼	15½	14	11⅜	9⅜
16	57	15	10	8	4⅞	7	6¼	19	15	15¾	15	13½	11⅛	9⅛
15½	55½	15	5	8	2¼	7	3⅞	18½	14½	15¼	14½	13⅛	10¾	8⅞
15	54	15	0	7	11⅝	7	1½	18	14	14¾	14	12⅝	10⅜	8½
14½	52½	14	7	7	9	6	11⅛	17½	13½	14¼	13½	12¼	10	8¼
14	51	14	2	7	6¼	6	8¾	17	13⅛	13¾	13⅛	11⅞	9⅝	8
13½	49½	13	9	7	3⅝	6	6⅜	16½	12⅝	13¼	12⅝	11⅜	9¼	7⅝
13	48	13	4	7	1	6	4	16	12⅛	12¾	12⅛	11	9	7⅜
12½	46½	12	11	6	10¼	6	1⅝	15½	11⅝	12¼	11⅝	10½	8⅝	7⅛
12	45	12	6	6	7⅜	5	11¼	15	11¼	11¾	11¼	10⅛	8¼	6¾

* In consequence of the increased dimensions of Masts, the following proportions are now commonly introduced in the receipt of Sticks :

Heel............ 15/16 ⎫
1st ⎫ .... 60/61 ⎪
2nd ⎬ Quarter .... 20/21 ⎬ of the Partners.
3rd ⎭ .... 8/9 ⎪
Hounds .... 4/5 ⎭
Heads 2/3

TABLE III.—*Mast Timber.*

NORTH AMERICAN YARDS.							
Diameter at the slings in inches.	Length of the			Diameter at the			
				Quarters.			Yard-arms.
	Stick.	Quarters.		1	2	3	
				30/31	9/10	7/10	⅖*
inches.	feet.	ft.	in.	inches.	inches.	inches.	inches.
27	108	13	6	26⅛	24¼	18⅞	10¾
26½	108	13	6	25⅝	23¾	18½	10½
26	108	13	6	25⅛	23⅜	18⅛	10⅜
25½	106½	13	3¾	24⅝	22⅞	17¾	10⅛
25	105	13	1½	24⅛	22½	17⅜	10
24½	103½	12	11¼	23⅝	22	17⅛	9¾
24	102	12	9	23⅛	21½	16¾	9½
23½	99	12	4½	22⅝	21⅛	16⅜	9⅜
23	96	12	0	22¼	20⅝	16	9⅛
22½	94½	11	9¾	21¾	20¼	15¾	9
22	93	11	7½	21¼	19¾	15⅜	8¾
21½	90¾	11	4⅛	20¾	19¼	15	8½
21	88½	11	0¾	20¼	18⅞	14⅝	8⅜
20½	86¼	10	9⅜	19¾	18⅜	14¼	8⅛
20	84	10	6	19⅜	18	14	8
19½	82½	10	3¾	18¾	17½	13⅝	7¾
19	81	10	1½	18⅜	17⅛	13¼	7½
18½	78¾	9	10⅛	17¾	16⅝	12⅞	7⅜
18	76½	9	6	17⅜	16⅛	12½	7⅛
17½	75	9	4½	16⅞	15¾	12¼	7
17	73½	9	2¼	16⅜	15¼	11⅞	6¾
16½	70½	8	9¾	15⅞	14¾	11½	6⅝
16	67½	8	5¼	15⅜	14⅜	11⅛	6⅜

* In consequence of the Yards being increased at Arms, the Quarters will be increased as follows (Page 163):

1st	Quarter	40/41	of the given diameter or size of the Slings.
2nd		9/10	
3rd		¾	
Yard-arms		⅓	

TABLE IV.—*Mast Timber.*

SQUARE RIGA STICKS FOR MASTS.

Dimensions at the partners in inches.	Length on deck.	Measuring Places.						Diameter at the				
		Distance of the partners from the heel.		Distance of the quarters apart.		Distance from the hounds for the head.		Heel.	Quarters.			Hounds.
									1	2	3	
								5/6	60/61	13/14	6/7	2/3
inches	feet	feet	ins.	feet	ins.	feet	ins.	ins.	ins.	ins.	ins.	ins.
30	99	20	0	17	3	10	0	25	29½	27¾	25⅝	20
29½	97½	19	8	17	0	9	10	24½	29	27⅜	25¼	19⅔
29	96	19	4	16	9	9	8	24⅛	28½	26⅞	24⅞	19⅓
28½	94½	19	0	16	6	9	6	23¾	28	26⅜	24⅜	19
28	93	18	8	16	3	9	4	23⅜	27½	26	24	18⅔
27½	91½	18	4	16	0	9	2	22⅞	27	25½	23½	18⅓
27	90	18	0	15	9	9	0	22½	26½	25	23⅛	18
26½	88½	17	8	15	6	8	10	22	26	24⅝	22⅝	17⅔
26	87	17	4	15	3	8	8	21⅝	25½	24⅛	22¼	17⅓
25½	85½	17	0	15	0	8	6	21¼	25	23⅝	21⅞	17
25	84	16	8	14	9	8	4	20⅞	24½	23⅛	21⅜	16⅔
24½	82½	16	4	14	6	8	2	20⅜	24	22¾	21	16⅓
24	81	16	0	14	3	8	0	20	23½	22¼	20½	16
23½	79½	15	8	14	0	7	10	19⅝	23	21⅞	20⅛	15⅔
23	78	15	4	13	9	7	8	19⅛	22½	21⅜	19¾	15⅓
22½	76½	15	0	13	6	7	6	18¾	22⅛	20⅞	19¼	15
22	75	14	8	13	3	7	4	18⅜	21⅝	20⅜	18⅞	14⅔
21½	73½	14	4	13	0	7	2	17⅞	21⅛	19⅞	18⅜	14⅓
21	72	14	0	12	9	7	0	17½	20⅝	19½	18	14
20½	70½	13	8	12	6	6	10	17	20⅛	19	17½	13⅔
20	69	13	4	12	3	6	8	16⅝	19⅝	18½	17⅛	13⅓
19½	67½	13	0	12	0	6	6	16¼	19⅛	18	16⅝	13
19	66	12	8	11	9	6	4	15⅞	18⅝	17⅝	16¼	12⅔
18½	64½	12	4	11	6	6	2	15⅜	18⅛	17⅛	15⅞	12⅓
18	63	12	0	11	3	6	0	15	17⅝	16⅝	15⅜	12
17½	61½	11	8	11	0	5	10	14½	17¼	16¼	15	11⅔
17	60	11	4	10	9	5	8	14⅛	16¾	15¾	14½	11⅓
16½	58½	11	0	10	6	5	6	13¾	16¼	15¼	14⅛	11
16	57	10	8	10	3	5	4	13⅜	16⅝	14⅞	13¾	10⅔
15½	55½	10	4	10	0	5	2	12⅞	15¼	14⅜	13¼	10⅓
15	54	10	0	9	9	5	0	12½	14¾	13⅞	12⅞	10
14½	52½	9	8	9	6	4	10	12	14¼	13½	12⅜	9⅔
14	51	9	4	9	3	4	8	11⅝	13¾	13	12	9⅓
13½	49½	9	0	9	0	4	6	11¼	13¼	12½	11½	9
13	48	8	8	8	9	4	4	10⅞	12¾	12	11⅛	8⅔
12½	46½	8	4	8	6	4	2	10⅜	12¼	11½	10⅝	8⅓
12	45	8	0	8	3	4	0	10	11¾	11⅛	10¼	8
11½	43½	7	8	8	0	3	10	9½	11¼	10⅝	9¾	7⅔
11	42	7	4	7	9	3	8	9⅛	10¾	10⅛	9⅜	7⅓
10½	40½	7	0	7	6	3	6	8¾	10¼	9¾	9	7
10	39	6	8	7	3	3	4	8¼	9¾	9¼	8½	6⅔
9½	37½	6	4	7	0	3	2	7⅞	9¼	8¾	8⅛	6⅓
9	36	6	0	6	9	3	0	7½	8¾	8¼	7⅝	6
8½	34½	5	8	6	6	2	10	7	8¼	7⅞	7¼	5⅔
8	33	5	4	6	3	2	8	6⅝	7¾	7⅜	6¾	5⅓
7½	31½	5	0	6	0	2	6	6¼	7⅜	6⅞	6⅜	5
7	30	4	8	5	9	2	4	5⅞	6⅞	6½	6	4⅔
6½	28½	4	4	5	6	2	2	5⅜	6⅜	6	5½	4⅓
6	27	4	0	5	3	2	0	5	5⅞	5½	5⅛	4

TABLE V.—*Mast Timber.*

HAND MASTS.

Diameter at the butt in inches.	Circumference at the butt in hands.	Length in feet.	Distance of the measuring places from the		Diameter at the top in inches.	Circumference at the top in hands.
			Butt.	Top.		
inches	hands	feet	ft. in.	ft. in.	inches	hands
7⅝	6	36	4 0	4 0	5 1/11	4
8¼	6½	37½	4 4	4 2	5 17/33	4⅓
8⅞	7	39	4 8	4 4	5 31/33	4⅔
9½	7½	40½	5 0	4 6	6 4/11	5
10⅛	8	42	5 4	4 8	6 26/33	5⅓
10¾	8½	43½	5 8	4 10	7 7/33	5⅔
11⅜	9	45	6 0	5 0	7 7/11	6
12⅛	9½	46½	6 4	5 2	8 2/33	6⅓
12¾	10	48	6 8	5 4	8 16/33	6⅔
13⅜	10½	49½	7 0	5 6	8 10/11	7
14	11	51	7 4	5 8	9 ⅓	7⅓
14⅝	11½	52½	7 8	5 10	9 25/33	7⅔
15¼	12	54	8 0	6 0	10 2/11	8
15⅞	12½	55½	8 4	6 2	10 20/33	8⅓
16½	13	57	8 8	6 4	11 1/33	8⅔
17¼	13½	58½	9 0	6 6	11 5/11	9
17⅞	14	60	9 4	6 8	11 29/33	9⅓
18½	14½	61½	9 8	6 10	12 10/33	9⅔
19⅛	15	63	10 0	7 0	12 8/11	10
19¾	15½	64½	10 4	7 2	13 5/33	10⅓
20⅜	16	66	10 8	7 4	13 19/33	10⅔
21	16½	67½	11 0	7 6	14	11
21⅝	17	69	11 4	7 8	14 14/33	11⅓
22¼	17½	70½	11 8	7 10	14 28/33	11⅔
22⅞	18	72	12 0	8 0	15 3/11	12
23½	18½	73½	12 4	8 2	15 23/33	12⅓
24¼	19	75	12 8	8 4	16 4/33	12⅔
24⅞	19½	76½	13 0	8 6	16 6/11	13
25½	20	78	13 4	8 8	16 32/33	13⅓
26⅛	20½	79½	13 8	8 10	17 13/33	13⅔
26¾	21	81	14 0	9 0	17 9/11	14
27⅜	21½	82½	14 4	9 2	18 8/33	14⅓
28	22	84	14 8	9 4	18 ⅔	14⅔
28⅝	22½	85½	15 0	9 6	19 1/11	15
29¼	23	87	15 4	9 8	19 17/33	15⅓
29⅞	23½	88½	15 8	9 10	19 31/33	15⅔
30½	24	90	16 0	10 0	20 4/11	16
31⅛	24½	91½	16 4	10 2	20 26/33	16⅓
32¼	25	93	16 8	10 4	21 7/33	16⅔

TABLE VI.—*Mast Timber.*

Names of Spars.	Length.	To Measure.		To Measure.	
		In Diameter.	At distance from the butt.	In Diameter.	At distance from the top.
	ft. ft.	in. in.	ft. in.	in.	ft. in.
Cant	34 to 36	7 to 6½	3 4	4	3 8
Barling	31 to 33	6 to 5½	2 8	3¼	3 4
Boom	28 to 30	5 to 4½	2 0	2½	3 0
Middling	23 to 26	4 to 3½	1 4	1⅜	2 8
Small............	19 to 22	3 to 2½	0 8	1	2 4

ON CONVERTING TREES FOR THE PARTS OF A MAST.

General Observations.—In appropriating sticks employed for mast-making, the smallest diameters under the several specifications, that can be brought in for the various purposes, are used. The sticks are likewise well examined, to ascertain the depth of the sap, and the extent of the defects, that, before the conversion is gone too far, they may be appropriated (if necessary) for other, though inferior, purposes than those for which they were intended.

In converting the different masts, with the several parts of made-masts, bowsprits, yards, &c., it will commonly require trees under such specifications as are given in the following Tables. In the Tables that give the lengths for the different pieces that compose the made-masts on Sir Robert Seppings's plan, the length will be found sufficiently near for the converter, as they will commonly fall within an inch, according to the present mode of spacing the hoops; and by them the different lengths of timber may be selected for masts of the various lengths, without occasioning any waste.

The Diameter required for the different Sticks that compose the several parts of the common Made-mast. (Fig. 1, Plate III.)

Given Diameters in inches.	Of yellow Pine and Riga.				Given Diameters in inches.	Or yellow Pine and Riga.			
	Spindle.	Side-trees.	Cheeks.	Fishes.		Spindle.	Side-trees.	Cheeks.	Fishes.
41 in one piece	33	26½	34	26	33 in two pieces	20½	18	18	
in two	23	22½	21½		32½ in one	26½	22	27½	22
40½ in one	32½	26¼	33½	26	in two	19¾	17½	17½	
in two	22¾	22	21¼		32 in one	26	21½	27	21½
40 in one	32	26	33	26	in two	19	17	17	
in two	22½	21½	21		31½ in one	25½	21	26½	21
39½ in one	31½	25½	32½	25½	in two	19	17	17	
in two	22¼	21¼	20¾		31 in one	25¼	20¾	26¼	21
39 in one	31½	25	32	25½	in two	18¾	16¾	16¾	
in two	22	21	20½		30½ in one	24¾	20½	26	20½
38½ in one	31½	25	31¾	25	in two	18½	16½	16½	
in two	21¾	20½	20½		30 in one	24½	20	25½	20½
38 in one	30½	25	31½	25	in two	18½	16½	16½	
in two	21½	20	20½		29½ in one	24	19¾	25¼	20
37½ in one	31	24½	31¼	24½	in two	18	16	16	
in two	21¼	20	20¼		29 in one	23½	19½	24¾	20
37 in one	30	24	31	24½	in two	17½	16	16	
in two	21	20	20		28½ in one	23¼	19½	24⅜	19⅞
36½ in one	29½	23½	30½	24	28 do.	23	19½	24	19½
in two	21	20	19¾		27½ do.	22½	19¼	23½	19
36 in one	29½	23	30	23½	27 do.	22	19	23¼	19
in two	21	20	19½		26½ do.	21½	18¾	22⅞	18½
35½ in one	29	23	29¾	23½	26 do.	21	18¾	22½	18½
in two	21	19½	19¼		25½ do.	20½	18¼	22½	18
35 in one	28½	23	29½	23	25 do.	20	18	22¼	18
in two	21	19¼	19		24½ do.	20	18	21½	17½
34½ in one	28	22¾	29	22½	24 do.	20	17¼	21	17½
in two	20¾	19	18¾		23½ do.	19½	16½	20½	17½
34 in one	27½	22⅜	28½	22½	23 do.	19	16	20	17
in two	20⅝	18¾	18⅜		22½ do.	18½	15½	19½	17
33½ in one	27	22½	28	22	22 do.	18	15	19	16½
in two	20½	18½	18		21½ do.	17½	14½	19	16½
33 in one	27	22½	28	22	21 do.	17	14	19	16

The Diameters of Sticks required for making Single-tree Masts, Bowsprits, Top-masts, Yards, &c. (Plate III.)

Single-tree masts.			Made bowsprits. (Fig. 4.)			Single-tree bowsprits.		Top-masts.				Lower-yards. (Fig. 7.)					Top-sail-yards.						
														Made of				Made of					
																				What they require to be lengthened.			
Given Diameters in inches.	Trees.	Cheeks.	Given Diameters in inches.	Trees.	Fishes.	Given diameters in inches.	Trees.	Given diameters in inches.	Trees.	Given diameters in inches.	Trees.	Given Diameters.	No. of sticks.	Yellow pine masts.	Yellow pine yards.	Riga hand-masts.	Given Diameters.	Riga masts.	Riga hand-masts.	Riga masts.		Riga hand-masts.	
											hands.						ins.	ins.	hands.	ft.	ins.	ft.	ins.
25	26½	22	37	23	25	31	32	22	23	12 Riga, hand	10	26	2	27			17	20	16½	11	8	11	2
24½	26	22	36½	23	25	30½	31½	21½	22½	11½ do.	9½	25½	2	26½			16½	19½	16½	8	3	6	9
24	25½	21	36	22½	24½	30	31	21	22	11 do.	9½	25	2	26			16	19	16	7	8	7	8
23½	25	20½	35½	22½	24½	29½	30½	20½	21½	10½ do.	9	24½	2	25½			15½	19	15½	4	6	6	0
23	24½	20	35	22	24	29	30	20	21	10 do.	8½	24	2	25			15	18	15½	5	0	5	0
22½	23½	19½	34½	22	24	28½	29½	19½	20½	9½ do.	8	23½	2	24½			14½	18	15	6	6	9	0
22	23	19	34	21½	23½	28	29	19	20	9 do.	7½	23	2	24			14	17½	14½	9	4	10	10
21½	22½	19	33½	21½	23½	27½	28½	18½	19½	8½ do.	7½	22½	2	23½			13½	16½	13½	6	0	6	0
21	22	18½	33	21	23	27	28	18	19	8 do.	7	22	2	23			13		13½			3	0
20½	21½	18	32½	21	23	26½	27½	17½	18½	7½ do.	6½	21½	2	22½			12½		12½			5	5
20	21	17½	32	20½	22½	26	27	17	18	7 do.	6	21	2	22			12		12½			3	0
19½	20½	17½	31½	20½	22½	25½	26½	16½	17½	6½ do.	6	20½	2	21½			11½		11½				10
19	20	17	31	20	22	25	26	16	17			20	2	21			11		11				9
18½	19½	17	30½	20	22	24½	25½	15½	16½			19½	2	20½			10½		10½				
18	19	16½	30	19½	21½	24	25	15 Riga	16			19	1		20		10		10				
17½	18½	16½	29½	19½	21½	23½	24½	Red pine	16			18½	1		19½		9½		9½				
17	18	16	29	19	21	23	24	14½ Riga	15½			18	1		19		9		9½				
16½	17½	15½	28½	19	21	22½	23½	Red pine	15½			17½	1		18½		8½		9				
16	17	15½	28	18½	20½	22	23	14 Riga	15			17	1		18		8		8½				
15½	16½	15	27½	18½	20½	21½	22½	Red pine	15			16½	1		17½		7½		8				
15	16	15	27	18	20	21	22	13½ Riga	14½			16	1		17		7		7½				
			26½	18	20	20½	21½	Red pine	14½			15½	1		16½		6½		7				
			26	17½	19½	20 Riga	21	13 Riga	14			15	1		16	16	6		6½				
			25½	17½	19½	Yellow pine	21	Red pine	14			14½	1		15½	15½							
			25	17	19	19½ Riga	20½	12½ Riga	13½			14	1		15	15							
			24½	17	19	Yellow pine	20½	Red pine	13½			13½	1		14½	14½							
			24	16	18½	19 Riga	20					13	1		14	14							
			23½	16	18½	Yellow pine	20					12½	1		13½	13½							
			23	15½	18	18½ Riga	19½					12	1			12½							
						Yellow pine	19½					11½	1			12							
						18 Riga	19					11	1			11½							
						Yellow pine	19					10½	1			11							
						17½ Riga	18½					10	1			10½							
						Yellow pine	18½					9½	1			10							
						17 Riga	18					9	1			9½							
						Yellow pine	18																

TABLE.—*Showing the Lengths of the different Pieces that compose the new Made-ast, for Ships of the Line, on the Plan of Sir Robert Seppings.* (Fig. 2, Plate III.)

mast, including the additional length of the head.	FORE FISH.									AFTER FISH.											
	Upper.			Second.			Third.			Upper.			Second.			Third.			Fourth.		
	No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.		No. of pieces.	Length of pieces.	
feet.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.
128	1	45	11⅜	1			1	45	11⅜	1	24	6¼	1	39	5¼	1	39	5¼	1	24	6¼
	1	26	3¾	1	39	5¼	1	26	3¾	1	44	4	1	39	4	1	44	4	1		
127	1	45	6¾	1			1	45	6¾	1	24	5	1	39	1	1	39	1	1	24	5
	1	26	0¼	1	39	1	1	26	0¼	1	44	0	1	39	0	1	44	0	1		
126	1	45	2⅝	1			1	45	2⅝	1	24	3¼	1	38	8¾	1	38	8¾	1	24	3¼
	1	25	9¾	1	38	8¾	1	25	9¾	1	43	8	1	38	8	1	43	8	1		
125	1	44	9½	1			1	44	9½	1	24	1⅜	1	38	4⅝	1	38	4⅝	1	24	1⅜
	1	25	7¼	1	38	4½	1	25	7¼	1	43	4	1	38	4	1	43	4	1		
124	1	44	5	1			1	44	5	1	23	11⅝	1	38	0⅜	1	38	0⅜	1	23	11⅝
	1	25	4⅞	1	38	0¼	1	25	4⅞	1	43	0	1	38	0	1	43	0	1		
123	1	44	0½	1			1	44	0½	1	23	9¾	1	37	8¼	1	37	8¼	1	23	9¾
	1	25	2⅛	1	37	8¼	1	25	2⅛	1	42	7⅞	1	37	8⅛	1	42	7⅞	1		
122	1	43	7⅛	1			1	43	7⅛	1	23	7¼	1	37	4⅛	1	37	4⅛	1	23	7¼
	1	24	11	1	37	3¾	1	24	11	1	42	4	1	37	4	1	42	4	1		
121	1	43	2¼	1			1	43	2¼	1	23	5¼	1	37	0¼	1	37	1¼	1	23	5¼
	1	24	8	1	37	0½	1	24	8	1	42	0	1	37	0	1	42	0	1		
120	1	42	10½	1			1	42	10½	1	23	2¾	1	36	9¼	1	36	9¼	1	23	2¾
	1	24	6	1	36	9	1	24	6	1	41	7½	1	36	9	1	41	7½	1		
119	1	42	7	1			1	42	7	1	22	11½	1	36	6½	1	36	6½	1	22	11½
	1	24	4	1	36	6	1	24	4	1	41	3	1	36	6	1	41	3	1		
118	1	42	3½	1			1	42	3½	1	22	9	1	36	3	1	36	3	1	22	9
	1	24	2	1	36	3	1	24	2	1	40	10½	1	36	3	1	40	10½	1		
117	1	41	11½	1			1	41	11½	1	22	6½	1	35	11½	1	35	11½	1	22	6½
	1	23	11¾	1	35	11½	1	23	11¾	1	40	6¼	1	35	11½	1	40	6¼	1		
116	1	41	7¼	1			1	41	7¼	1	22	4	1	35	8	1	35	8	1	22	4
	1	23	9¾	1	35	8	1	23	9¾	1	40	2	1	35	8	1	40	2	1		
115	1	41	3½	1			1	41	3½	1	22	1½	1	35	4½	1	35	4½	1	22	1½
	1	23	7¼	1	35	4½	1	23	7¼	1	39	9¾	1	35	4½	1	30	9¾	1		
114	1	40	11½	1			1	40	11½	1	21	11	1	35	1	1	35	1	1	21	11
	1	23	5	1	35	1	1	23	5	1	39	5½	1	35	1	1	39	5½	1		
113	1	39	11⅝	1			1	39	11⅝	1	21	8½	1	34	9½	1	34	9½	1	21	8½
	1	23	2½	1	34	9½	1	23	2½	1	39	1¼	1	34	9½	1	39	1¼	1		
112	1	40	0	1			1	40	0	1	21	6⅛	1	34	5⅞	1	34	5⅞	1	21	6⅛
	1	22	10	1	34	4	1	22	10	1	38	9⅝	1	34	5⅞	1	38	9	1		
111	1	39	10⅝	1			1	39	10⅝	1	21	3¾	1	34	2⅜	1	34	2⅜	1	21	3¾
	1	22	9½	1	34	2¼	1	22	9½	1	38	4⅞	1	34	2¼	1	38	4⅞	1		
110	1	39	6	1			1	39	6	1	21	1⅜	1	33	10⅜	1	33	10⅜	1	21	1⅜
	1	22	7	1	33	10	1	22	7	1	38	0¾	1	33	10½	1	38	0¾	1		
09	1	39	1⅜	1			1	39	1⅜	1	20	11½	1	33	6¼	1	33	6¼	1	20	11½
	1	22	4¼	1	33	6¼	1	22	4¼	1	37	8½	1	33	6	1	37	8½	1		
08	1	38	8¾	1			1	38	8¾	1	20	9½	1	33	2½	1	33	2½	1	20	9½
	1	22	1¾	1	33	2	1	22	1¾	1	37	4¾	1	33	2½	1	37	4¾	1		
07	1	38	4	1			1	38	4	1	20	8¼	1	32	9¾	1	32	9¾	1	20	8¼
	1	21	11⅝	1	32	9¼	1	21	11⅝	1	37	1⅝	1	32	8¾	1	37	1⅝	1		
06	1	37	11½	1			1	37	11½	1	20	7	1	32	5	1	32	5	1	20	7
	1	21	9¾	1	32	3½	1	21	9¾	1	36	6	1	32	4½	1	36	6	1		
05	1	37	6¼	1			1	37	6¼	1	20	5	1	32	1	1	32	1	1	20	5
	1	21	7	1	31	10	1	21	7	1	36	6⅛	1	31	11¼	1	36	6⅛	1		
04	1	37	0	1			1	37	0	1	20	4	1	31	8	1	31	8	1	20	4
	1	21	3¾	1	31	5	1	31	3¾	1	36	2½	1	31	7	1	36	2½	1		
03	1	36	6	1			1	36	6	1	20	2¾	1	31	3¼	1	31	3¼	1	20	2¼
	1	21	1	1	30	10	1	21	1	1	35	11¼	1	31	1½	1	35	11¼	1		
02	1	36	3½	1			1	36	3½	1	20	0⅞	1	30	11⅛	1	30	11⅛	1	20	0⅞
	1	20	10½	1	30	7	1	20	10½	1	35	7⅛	1	30	9¼	1	35	7⅛	1		
01	1	35	11	1			1	35	11	1	19	11¼	1	30	6¾	1	30	6¾	1	19	11¼
	1	20	10	1	30	2	1	20	10	1	35	3¾	1	30	4½	1	35	3¾	1		
00	1	35	6	1			1	35	6	1	19	9¾	1	30	2¼	1	30	2¼	1	19	9¾
	1	20	7⅛	1	29	9¼	1	20	7⅛	1	35	0¼	1	29	11½	1	35	0¼	1		
99	1	35	0	1			1	35	0	1	19	8¼	1	29	9¾	1	29	9¾	1	19	8¼
	1	20	4¼	1	29	3½	1	20	4¼	1	34	8¾	1	29	6½	1	34	8¾	1		
98	1	35	1⅛	1			1	35	1⅛	1	19	6⅞	1	29	5⅛	1	29	5⅛	1	19	6⅞
	1	20	3	1	29	0	1	20	3	1	34	5¼	1	29	1½	1	34	5¼	1		

TABLE :—*Showing the Lengths of different Pieces that compose the new Made-mast, for Ships of the Line, on the Plan of Sir Robert Seppings.*

Whole length of mast, including the additional length of head.	CORE.									SIDE FISH.								
	Upper.			Second.			Third.			Upper.			Second.			Third.		
	No. of pieces	Length of pieces.		No. of pieces	Length of pieces.		No. of pieces	Length of pieces.		No. of pieces	Length of pieces.		No. of pieces	Length of pieces.		No. of pieces	Length of pieces.	
feet	No.	ft.	ins	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.	No.	ft.	ins.
128	2	57	5¼	2	39	4¾	2	31	2¾	2	31	2¾	2	39	4¾	2	51	5¼
	2	37	7¼	2	39	3½	2	50	11¼	2	50	11¼	2	39	3½	2	37	7¼
127	2	57	0	2	39	1	2	30	11	2	30	11	2	39	1	2	57	0
	2	37	5½	2	39	0½	2	50	6	2	50	6	2	39	0½	2	37	5½
126	2	56	6⅝	2	38	9⅛	2	30	8½	2	30	8½	2	38	9⅛	2	56	6⅝
	2	37	2⅜	2	38	9¼	2	50	0⅜	2	50	0⅜	2	38	9¼	2	37	2⅜
125	2	56	1¼	2	38	5¼	2	30	5½	2	30	5½	2	38	5	2	56	1¼
	2	36	10½	2	38	5	2	49	8½	2	49	8½	2	38	5¼	2	36	10½
124	2	55	8	2	38	1	2	30	3	2	30	3	2	38	1	2	55	8
	2	36	7⅛	2	38	1	2	49	3⅞	2	49	3⅞	2	38	1	2	36	7⅛
123	2	55	2⅜	2	37	9	2	30	0⅝	2	30	0⅝	2	37	9	2	55	2⅜
	2	36	3¼	2	37	9	2	48	11¼	2	48	11¼	2	37	9	2	36	3¼
122	2	54	9¼	2	37	5⅛	2	29	9⅝	2	29	9⅝	2	37	5⅛	2	54	9¼
	2	35	11⅛	2	37	6	2	48	6⅝	2	48	6⅝	2	37	6	2	35	11⅛
121	2	54	4	2	37	1	2	29	7	2	29	7	2	37	1	2	54	4
	2	35	9	2	37	1	2	48	2	2	48	2	2	37	1	2	35	9
120	2	53	10½	2	36	9⅜	2	29	3⅞	2	29	3⅞	2	36	9⅜	2	53	10½
	2	35	5¼	2	36	9⅜	2	47	9⅛	2	47	9⅛	2	36	9⅜	2	25	5¼
119	2	53	5	2	36	6¼	2	29	0¼	2	29	0¼	2	36	6¼	2	53	5
	2	35	1⅝	2	36	6¼	2	47	4⅛	2	47	4⅛	2	36	6¼	2	35	1⅝
118	2	52	11⅜	2	36	3	2	28	9⅜	2	28	9⅜	2	36	3	2	52	11⅜
	2	34	10	2	36	3	2	46	11	2	46	11	2	36	3	2	34	10
117	2	52	0¼	2	36	2½	2	28	9¼	2	28	9¼	2	35	11½	2	51	9¼
	2	34	6¼	2	35	11½	2	46	6½	2	46	6¼	2	35	11½	2	34	6¼
116	2	51	8¾	2	35	10	2	28	5¼	2	28	5¼	2	35	10	2	51	8¾
	2	34	2½	2	35	8	2	46	1½	2	46	1½	2	35	8	2	34	2½
115	2	51	5⅜	2	35	5½	2	28	1⅛	2	28	1⅛	2	35	4½	2	51	4⅜
	2	33	10¾	2	35	4½	2	45	8¾	2	45	8¾	2	35	4½	2	33	10¾
114	2	51	2	2	35	1	2	27	9	2	27	9	2	35	1	2	51	2
	2	33	7	2	35	1	2	45	4	2	45	4	2	35	1	2	33	7
113	2	50	9	2	34	9	2	27	6	2	27	6	2	34	9	2	50	9
	2	33	3½	2	34	9¼	2	44	11¼	2	44	11¾	2	34	9¼	2	33	3½
112	2	50	3¼	2	34	5½	2	27	3¼	2	27	3¼	2	34	5½	2	50	3¼
	2	33	0⅛	2	34	5½	2	44	6⅛	2	44	6⅛	2	34	5½	2	33	0⅛
111	2	49	9⅝	2	34	2⅛	2	27	0¼	2	27	0¼	2	34	2⅛	2	49	9⅝
	2	32	8½	2	34	2¼	2	44	1¼	2	44	1¼	2	34	2¼	2	32	8½
110	2	49	4	2	33	10	2	26	10	2	26	10	2	33	10	2	49	4
	2	32	5¼	2	33	10⅛	2	43	8⅛	2	43	8⅛	2	33	10⅛	2	32	5¼
109	2	48	10⅞	2	33	6⅛	2	26	7	2	26	7	2	33	6⅛	2	48	10⅞
	2	32	2	2	33	6⅝	2	43	3⅜	2	43	3⅜	2	33	6⅝	2	32	2
108	2	48	5½	2	33	1⅞	2	26	5	2	26	5	2	33	1⅞	2	48	5½
	2	31	10½	2	33	2¼	2	42	10¾	2	42	10¾	2	33	2¾	2	31	10½
107	2	48	0	2	32	10	2	26	2	2	26	2	2	32	10	2	48	0
	2	31	7¼	2	32	10⅞	2	42	5⅞	2	42	5⅞	2	32	10⅞	2	31	7¼
106	2	47	6⅜	2	32	6⅜	2	25	11¾	2	25	11¾	2	32	6⅜	2	47	6⅜
	2	31	3½	2	32	7¼	2	42	1¾	2	42	1½	2	32	7½	2	31	3½
105	2	47	1	2	32	3	2	25	8	2	25	8	2	32	3	2	47	1
	2	30	11¼	2	32	3¼	2	41	8½	2	41	8½	2	32	3¾	2	30	11¼
104	2	46	8	2	31	11	2	25	5	2	25	5	2	31	11	2	46	8
	2	30	8⅛	2	31	11⅞	2	41	3¾	2	41	3¾	2	31	11⅞	2	30	8⅛
103	2	46	2⅜	2	31	7¼	2	25	2⅜	2	25	2⅜	2	31	7¼	2	46	2⅜
	2	30	4⅛	2	31	7¾	2	40	11⅞	2	40	11⅞	2	31	7¾	2	30	4⅛
102	2	45	9	2	31	4	2	24	11	2	24	11	2	31	4	2	45	9
	2	30	1⅛	2	31	4⅛	2	40	6½	2	40	6½	2	31	4⅛	2	30	1⅛
101	2	45	4	2	31	0	2	24	8	2	24	8	2	31	0	2	45	4
	2	29	9¼	2	31	0½	2	40	2¼	2	40	2¼	2	31	0½	2	29	9¼
100	2	44	11	2	30	7⅛	2	24	5⅜	2	24	5⅝	2	30	7⅛	2	44	11
	2	29	6¼	2	30	7⅜	2	39	9⅞	2	39	9⅞	2	30	7⅜	2	29	6¼
99	2	44	6	2	30	2	2	24	4	2	24	4	2	30	2	2	44	6
	2	29	5	2	30	1¼	2	39	5¼	2	39	5¼	2	30	1¾	2	29	5
98	2	44	1	2	29	8½	2	24	2⅜	2	24	2½	2	29	8⅜	2	44	1
	2	29	2⅛	2	29	8⅜	2	39	1¼	2	39	1¼	2	29	8⅜	2	29	2¼

TABLE:—*for Frigates.*

Showing the Lengths of the different Pieces of Timber that compose the new Made-mast, on the plan of Sir Robert Seppings. (Fig. 3, Plate III.)

Whole length of Mast, including the additional length of the Head.	CORE.						FORE FISH.				AFTER FISH.					
	Upper.		Middle.		Lower.		Upper.		Lower.		Upper.		Middle.		Lower.	
	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.
feet.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.
99	1	27 2	1	37 2	1	34 7	1	49 6	1	49 6	1	34 3½	1	37 2	1	27 10¾
98	1	26 10½	1	36 10	1	34 3½	1	49	1	49	1	33 11½	1	36 6	1	27 6½
97	1	26 6½	1	36 6	1	33 11	1	48 6	1	48 6	1	33 7½	1	36 2	1	27 2½
96	1	26 2½	1	36 2	1	33 7	1	48	1	48	1	33 3½	1	36 2	1	26 10½
95	1	26 0¾	1	35 8	1	33 3	1	47 6	1	47 6	1	33 3	1	35 8	1	26 1
94	1	25 9½	1	35 4	1	32 10½	1	47	1	47	1	32 10¾	1	35 4	1	25 9¼
93	1	25 7¼	1	34 10¼	1	32 6½	1	46 6	1	46 6	1	25 7¼	1	34 10¼	1	32 6½
92	1	25 3¼	1	34 6¼	1	32 2½	1	46 0	1	46 0	1	32 2½	1	34 6¼	1	25 3¼

TABLE :—*Showing the Lengths of diffe*
Made-mast, for Ships of the Line, on th

Whole length of mast, including the additional length of head.	CORE.							
	Upper.			Second.			Third.	
	No. of pieces	Length of pieces.		No. of pieces	Length of pieces.		No. of pieces	Length pieces
feet	No.	ft.	ins	No.	ft.	ins.	No.	ft.
128	2	57	5¼	2	39	4¼	2	31
	2	37	7¾	2	39	3½	2	50
127	2	57	0	2	39	1	2	30
	2	37	5½	2	39	0½	2	50
126	2	56	6⅜	2	38	9⅛	2	30
	2	37	2⅜	2	38	9¼	2	50
125	2	56	1¼	2	38	5¼	2	30
	2	36	10½	2	38	5	2	49
124	2	55	8	2	38	1	2	3
	2	36	7⅛	2	38	1	2	4
123	2	55	2⅜	2	37	9	2	3
	2	36	3¼	2	37	9	2	4
122	2	54	9¼	2	37	5⅛	2	
	2	35	11⅜	2	37	6	2	
121	2	54	4	2	37	1	2	
	2	35	9	2	37	1	2	
120	2	53	10½	2	36	9⅜	2	
	2	35	5¼	2	36	9⅜	2	
119	2	53	5	2	36	6¼	2	
	2	35	1⅝	2	36	6¼	2	
118	2	52	11⅜	2	36	3	2	
	2	34	10	2	36	3	2	
117	2	52	0¼	2	36	2½	2	
	2	34	6¼	2	35	11½	2	
116	2	51	8¾	2	35	10	2	
	2	34	2½	2	35	8	2	
115	2	51	5⅜	2	35	5½		
	2	33	10¾	2	35	4½		
114	2	51	2	2	35	1		
	2	33	7	2	35	1		
113	2	50	9	2	34	9		
	2	33	3½	2	34	9¼		
112	2	50	3¼	2	34	5½		
	2	33	0⅜	2	34	5½		
111	2	49	9⅝	2	34	2⅜		
	2	32	8½	2	34	2¼		
110	2	49	4	2	33	10		
	2	32	5¼	2	33	10		
109	2	48	10⅞	2	33	6		
	2	32	2	2	33	6		
108	2	48	5½	2	33	1		
	2	31	10½	2	33	2		
107	2	48	0	2	32	10		
	2	31	7¼	2	32	10		
106	2	47	6⅜	2	32	6		
	2	31	3½	2	32	7		
105	2	47	1	2	32			
	2	30	11¼	2	32			
104	2	46	8	2	31	1		
	2	30	8⅛	2	31	1		
103	2	46	2⅜	2	31			
	2	30	4⅜	2	31			
102	2	45	9	2	31			
	2	30	1⅛	2	31			
101	2	45	4	2	31			
	2	29	9¼	2	31			
100	2	44	11	2	30			
	2	29	6¼	2	30			
99	2	44	6	2	3			
	2	29	5	2	3			
98	2	44	1	2	2			
	2	29	2⅜	2				

96	1	18	10	1	36	2	1	41	0	1	41	0½	1	36	2	1	[illegible]	[illegible]	1	[illegible]	1	1					
95	1	19	0	1	35	8	1	40	4¼	1	40	3¼	1	35	8	1	19	0½	1	36	9⅛	1	35	8	1	22	7½
94	1	18	8	1	35	4	1	40	0¼	1	40	0¼	1	35	3¼	1	18	8	1	36	5	1	35	4	1	22	3¼
93	1	18	8	1	34	10¼	1	39	5¼	1	39	5¼	1	34	10¼	1	18	8	1	36	0⅛	1	34	10¼	1	22	1⅛
92	1	18	4	1	34	6¼	1	39	1¼	1	39	1¼	1	34	6¼	1	18	4	1	35	8⅛	1	34	6¼	1	21	9¼

Whole length of Mast, including the additional length of Head.	Upper.		Middle.		Lower.													
	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	pieces.	pieces.			
ft.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.
99	1	45 9	1	37 2	1	16 1	1	30 11	1	37 2	1	30 11	1	23 6	1	37 2	1	38 4
98	1	45 5	1	36 10	1	15 9	1	30 7	1	36 10	1	30 7	1	23 2	1	36 10	1	38 0
97	1	45 1	1	36 6	1	15 5	1	30 3	1	36 6	1	30 3	1	22 10	1	36 6	1	37 8
96	1	44 9	1	36 2	1	15 1	1	29 11	1	36 2	1	29 11	1	22 6	1	36 2	1	37 4
95	1	43 10⅜	1	35 8¼	1	15 5⅞	1	29 7⅞	1	35 8¼	1	29 7⅞	1	22 6½	1	35 8	1	36 9½
94	1	43 6⅛	1	35 4	1	15 1⅞	1	29 3⅞	1	35 4	1	29 3⅞	1	22 2⅝	1	35 4	1	36 5⅛
93	1	42 11⅜	1	34 10¼	1	15 2⅜	1	29 0⅞	1	34 10¼	1	29 0⅞	1	22 1⅝	1	34 10¼	1	36 0⅛
92	1	42 7¾	1	34 6¼	1	14 10⅜	1	28 8⅞	1	34 6½	1	28 8⅞	1	21 9⅝	1	34 6½	1	35 8⅛

TABLE:—*for Frigates.*

Showing the Lengths of the different Pieces of Timber that compose the new Made-mast, on the plan of Sir Robert Seppings.

Whole length of Mast, including the additional length of the Head.	SIDE FISH.						SIDE FISH.						ARIS STARB. FORE.					
	Upper.		Middle.		Lower.		Upper.		Middle.		Lower.		Upper.		Middle.		Lower.	
	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.
feet,	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.	No.	feet ins.
99	1	19 10	1	37 2	1	42 0	1	42 0¼	1	37 2	1	19 9½	1	38 4	1	37 2	1	23 6
98	1	19 6	1	36 10	1	41 8	1	42 8¼	1	36 10	1	19 5½	1	38 0	1	36 10	1	23 2
97	1	19 2	1	36 6	1	41 4	1	41 4½	1	36 6	1	19 1½	1	37 8	1	36 6	1	22 10
96	1	18 10	1	36 2	1	41 0	1	41 0½	1	36 2	1	18 9½	1	37 4	1	36 2	1	22 6
95	1	19 0	1	35 8	1	40 4¼	1	40 3¼	1	35 8	1	19 0½	1	36 9⅛	1	35 8	1	22 7½
94	1	18 8	1	35 4	1	40 0¼	1	40 0¼	1	35 3¼	1	18 8	1	36 5	1	35 4	1	22 3½
93	1	18 8	1	34 10¼	1	39 5¼	1	39 5¼	1	34 10¼	1	18 8	1	36 0⅛	1	34 10¼	1	22 1⅛
92	1	18 4	1	34 6½	1	39 1¼	1	39 1¼	1	34 6¼	1	18 4	1	35 8⅛	1	34 6¼	1	21 9⅛

TABLE:—*for Frigates.*

Showing the Lengths of the different Pieces of Timber that compose the new Made-mast, on the Plan of Sir Robert Seppings.

Whole length of Mast, including the additional length of Head.	ARIS STARB. AFT.						ARIS LARB. FORE.						ARIS LARB. AFT.					
	Upper.		Middle.		Lower.		Upper.		Middle.		Lower.		Upper.		Middle.		Lower.	
	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.	No. of pieces.	Length of pieces.
ft.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.	No.	ft. ins.
99	1	45 9	1	37 2	1	16 1	1	30 11	1	37 2	1	30 11	1	23 6	1	37 2	1	38 4
98	1	45 5	1	36 10	1	15 9	1	30 7	1	36 10	1	30 7	1	23 2	1	36 10	1	38 0
97	1	45 1	1	36 6	1	15 5	1	30 3	1	36 6	1	30 3	1	22 10	1	36 6	1	37 8
96	1	44 9	1	36 2	1	15 1	1	29 11	1	36 2	1	29 11	1	22 6	1	36 2	1	37 4
95	1	43 10⅜	1	35 8¼	1	15 5⅞	1	29 7⅞	1	35 8¼	1	29 7⅞	1	22 6½	1	35 8	1	36 9½
94	1	43 6⅛	1	35 4	1	15 1⅞	1	29 3⅞	1	35 4	1	29 3⅞	1	22 2⅝	1	35 4	1	36 5⅜
93	1	42 11⅜	1	34 10¼	1	15 2⅜	1	29 0⅞	1	34 10¼	1	29 0⅞	1	22 1⅝	1	34 10¼	1	36 0⅝
92	1	42 7¾	1	34 6¼	1	14 10⅜	1	28 8⅞	1	34 6½	1	28 8⅞	1	21 9⅝	1	34 6½	1	35 8⅜

The Diameter of Sticks, and the Square of Timber required for the Mast made with the Core in four, four Fishes and four Cheeks. (Fig. 30, Plate III.)

Given Diameters in inches.	OF YELLOW PINE OR RIGA.						
	Square of each piece of Core.	No. of pieces in each Core.	Diameter of sticks for Fishes.	No. of Sticks for Fishes.	Cheeks on the fore & aft sides.	Cheeks on the larboard and starboard sides.	Cheeks if in two, made from Timber square.
ins.	ins.		ins.		ins.	ins.	ins.
42	10½	4	24	2	22	34	17
41½	10½	4	24	2	22	33½	17
41	10½	4	23½	2	22	33½	16¾
40½	10	4	23½	2	21½	33	16½
40	10	4	23	2	21½	32½	16¼
39½	10	4	23	2	21½	32	16
39	9¾	4	22½	2	21	31½	15¾
38½	9¾	4	22½	2	21	31½	15¾
38	9½	4	22	2	20½	31	15½
37½	9½	4	22	2	20½	30½	15½
37	9¼	4	21½	2	20	30	15
36½	9¼	4	21½	2	20	29½	14¾
36	9	4	21	2	19½	29	14¾
35½	9	4	21	2	19½	28½	14½
35	8¾	4	20½	2	19	28	14¼
34½	8¾	4	20½	2	19	28	14
34	8½	4	20	2	18½	27½	13¾
33½	8½	4	20	2	18½	27	13½
33	8¼	4	19½	2	18	27	13¼
32½	8¼	4	19½	2	18	26½	13
32	8	4	19	2	17½	26	13
31½	8	4	19	2	17½	26	12¾
31	7¾	4	18½	2	17	25½	12½
30½	7¾	4	18½	2	17	25	12¼
30	7½	4	18	2	16	24½	12¼

The Diameter required for the different Sticks that compose the several parts of the Mast made with short Spindle, two Side-trees lengthened, two Fishes and Cheeks. (Fig. 31, Plate III.)

Given Diameters in inches.	OF YELLOW PINE OR RIGA.				
	Spindle.	Side-trees.	Fishes.	Cheeks, if made in one.	Cheeks if in two, made from Timber square.
ins.	ins.	ins.	ins.	ins.	ins.
42	27	26	26	34	17
41½	27	26	26	34	17
41	26½	25½	25½	33½	16¾
40½	26½	25½	25½	33	16¾
40	26½	25	25	32½	16¼
39½	26	25	25	32	16
39	25½	24½	24½	32½	15¾
38½	25½	24½	24½	31½	15¾
38	25	24	24	31	15½
37½	25	24	24	30½	15½
37	24½	23½	23½	30	15
36½	24½	23½	23½	29½	14¾
36	24	23	23	29½	14¾
35½	24	23	23	29	14½
35	23½	22½	22½	28½	14¼
34½	23½	22½	22½	28	14
34	23	22	22	27½	13¾
33½	23	22	22	27	13½
33	22½	21½	21½	27	13½
32½	22½	21½	21½	26½	13¼
32	22	21	21	26	13
31½	22	21	21	25½	13
31	21½	20½	20½	25	12½
30½	21½	20½	20½	24½	12¼
30	21	20	20	24	12

The Diameter required for the different Sticks that compose the several parts of the Mast made with four principal Pieces scarphed and Cheeks. (Fig. 28, Plate III.)

Given Diameters in inches.	OF YELLOW PINE OR RIGA.			
	No. of principal Sticks.	Diameter of principal Sticks.	Cheeks, if made in one. Bowsprit of	Cheeks, if in two made from Timber square.
		ins.	ins.	ins.
42	5	24½	34	17
41½	5	24½	34	17
41	5	24	33½	16¾
40½	5	24	33	16½
40	5	23½	32½	16¼
39½	5	23½	32	16
39	5	23	31½	15¾
38½	5	23	31½	15¾
38	5	22½	31	15½
37½	5	22½	30½	15¼
37	5	22	30	15
36½	5	22	29½	14¾
36	5	21½	29½	14¾
35½	5	21½	29	14½
35	5	21	28½	14¼
34½	5	21	28	14
34	5	20½	27½	13¾
33½	5	20½	27	13½
33	5	20	27	13½
32½	5	20	26½	13¼
32	5	19½	26	13
31½	5	19½	25½	13
31	5	19	25	12½
30½	5	19	24½	12¼
30	5	18½	24	12

The Diameter required for the different Sticks that compose the several parts of the Mast made with short Spindle, two Side-Trees lengthened, and Cheeks. (Fig. 29, Plate III.)

Given Diameters in inches.	OF YELLOW PINE OR RIGA.					
	Spindle.	No. of Sticks for Spindle.	Side Trees.	No. of Sticks for Side Trees.	Cheeks, if made in one. Bowsprit of	Cheeks, if in two, made from Timber square.
ins.	ins.		ins.		ins.	ins.
42	25	2	24	4	34	17
41½	25	2	24	4	34	17
41	24½	2	23½	4	33½	16¾
40½	24½	2	23½	4	33	16½
40	24	2	23	4	32½	16¼
39½	24	2	22½	4	32	16
39	23½	2	22½	4	31½	15¾
38½	23½	2	22	4	31½	15¾
38	23	2	22	4	31	15½
37½	23	2	21½	4	30½	15¼
37	22½	2	21½	4	30	15
36½	22½	2	21	4	29½	14¾
36	22	2	21	4	29½	14¾
35½	22	2	20½	4	29	14½
35	21½	2	20½	4	28½	14¼
34½	21½	2	20	4	28	14
34	21	2	20	4	27½	13¾
33½	21	2	19½	4	27	13½
33	20½	2	19½	4	27	13½
32½	20½	2	19	4	26½	13¼
32	20	2	19	4	26	13
31½	20	2	18½	4	25½	13
31	19½	2	18½	4	25	12½
30½	19½	2	18	4	24½	12¼
30	19	2	18	4	24	12

The Diameter required for the different Sticks that compose the several parts of the Top and Butt Mast. (Fig. 27, Plate IV.)

Given Diameter in inches.	OF YELLOW PINE OR RIGA.				
	Head main Piece.	Heel main Piece.	Fishes.	Cheeks, if made in one. Bowsprit of	Cheeks, if in two, made from Timber square.
	ins.	ins.	ins.	ins.	ins.
42	34	33	26	34	17
41½	33½	32½	26	33½	17
41	33½	32½	25½	33½	16¾
40½	33	32	25½	33	16½
40	32½	31½	25	32½	16¼
39½	32	31	25	32	16
39	31½	30½	24½	31½	15¾
38½	31½	30½	24½	31½	15¾
38	31	30	24	31	15½
37½	30½	29½	24	30½	15¼
37	30	29	23½	30	15
36½	29½	28½	23½	29½	14¾
36	29	28½	23	29	14½
35½	28½	28	22½	28½	14¼
35	28	27½	22½	28	14¼
34½	28	27	22	28	14
34	27½	26½	22	27½	13¾
33½	27	26	21½	27	13½
33	27	26	21½	27	13½
32½	26½	25½	21	26½	13¼
32	26	25	21	26	13
31½	26	25	20½	26	13
31	25½	24½	20½	25½	12¾
30½	25	24	20	25	12½
30	24½	23½	20	24½	12¼

TO CONVERT THE SPINDLE.

The spindle is so converted, that the butt end may be upwards, and is lined the athwartship-way first. The middle line is struck upon the tree, and the lengths of the place of the hounds and second clasp hoop are marked; and from the head, half of the given length, and the additional length of head, is set down for the tail of the cheek.

From the size of the upper end, which is $\frac{6}{33}$ of the given diameter (Note, page 162), set off equally on each side of the middle, strike a straight line to the diameter of the mast, at the tail of the cheek, for the size from the head to the second clasp hoop; or, to save trouble, set off $\frac{7}{13}$ at the second clasp hoop, and strike a straight line from thence to the head; this line will be found to answer very nearly with the first line struck. Below the second clasp hoop, the spindle is lined straight to the lower end, where it is in general about $2\frac{1}{2}$ inches.

To line the fore and aft way, strike the middle line as before on the tree, and mark upon it the hounds, the first clasp hoop (which is 21 inches below the hounds), and the third quarter; then set off, equally on each side of the middle line, the size of the head, which is commonly $\frac{3}{8}$ of the given diameter; strike a straight line to the diameter at the third quarter; and, 3 feet below the first clasp hoop, set off $\frac{11}{18}$ of the diameter, and line it straight from thence to the lower end, where it is $\frac{1}{2}$ of the given diameter. At the first clasp set an inch and a half in, for an abutment for the fish, and thence draw a straight line to a distance of 3 feet below it.

The Side Trees.

The side trees are lined with the butt end downwards, and the athwartship-way first: set off on the stick, the partners, quarters, lower end of the spindle, and whole length, which is from the second clasp hoop to the heel.

On one side of the stick, range a line to represent the middle line of the mast; then apply the graduating batten at each quarter, and at the lower part of the spindle, with its end to the middle line, and take the half size of the spindle, which set off at the corresponding places, from the line representing the middle line at the side tree; and, at the same time, marking from the batten the diameters of the mast at the respective quarters and partners. This will give the form of the side tree, such as to conform to the spindle, and to the athwartship diameter of the mast.

To line the fore and aft way, which is done after it has been sawn to the athwartship form, strike upon it the middle line as before, and mark, on the side upon which the middle line has been struck, the places of the quarters, partners, and end of the spindle, and transfer the size of these respective places from the spindle to the side tree, and strike lines through them; below the partners, or lower end of the spindle, the side trees are made parallel.

It is very frequently the case, since the side trees are worked with the top end upwards, that the stick will not hold its breadth at the upper end; in which case pieces must be worked on its edges. In lining, therefore, hold a batten across the upper end, and range two lines to its size, here and at the partners; these lines will show the best manner of disposing of the piece on the edges, should it not be large enough, and strike it on as far down as the piece will hold, bringing the butts of the pieces under a hoop.

The Fore and after Fishes.

The fore and after fishes are worked with the butt end downwards, and are made as wide as they will work, bringing them upon one edge of the mast, rather than have the pieces too narrow; while, at the same time, they should not be more than $4\frac{1}{2}$ inches wide.

The fishes are lined with one edge straight, and have marked upon them the length (which is from the heel to the first clasp hoop under the hounds), quarters, and partners; then, with the graduating batten, take at the heel, partners, and quarters, and upper end of the fish, the fore-and-aft size of the spindle and side trees; and the difference between this and the diameters of the mast, at the several quarters, as on the graduating batten, will be the thickness of the fish, which, if set off at the respective quarters upon the stick, will give the outside of the fish.

On the Cheeks of the Mast.

Masts are in general cheeked from $18\frac{1}{2}$ inches diameter upwards; but if small masts were increased in diameter, and only such cheeked as the quality of the sticks might require, from having either bad knots at the top end, or being inferior in other respects, there would be a considerable saving of expense, since it requires for the cheeks of a mast the best part of those sticks which are suited for a bowsprit of the same diameter as that of the mast.

Cheeks are now mostly cut from yellow pine, and worked with the butt end upwards. The side next to the mast, or the sole of the cheek, is lined straight; and upon it are set off the length (which is half the length of the mast, together with the additional length of the head), and place of the stops or hounds.

They are made at the upper end $\frac{11}{48}$, and at the hounds $\frac{9}{37}$, of the given diameter: without this dimension, half the thickness of the trestle-trees is set out for the stops; and from thence to the lower end, where they are $\frac{5}{72}$ of the given diameter, they are lined straight.

For lining them the fore-and-aft way, a middle line is struck upon them, and the size of the mast from the head to the lower part of the hounds is set off equally on each side; from the lower part of the hounds to the lower end, where they are half the given diameter, they are lined straight.

To convert Bowsprits.—To line the Main Pieces.

The main pieces are worked with the butt-end inwards, and lined the athwartship-way first. Set off upon the tree the length and place of the bed, and at each end fix a batten ; then from batten to batten range two lines, keeping them apart at the outer end, to the diameter of the jib-boom, and at such a distance at the inner end that they may be apart at the outer part of the scarph half the given diameter of the bowsprit, placing them so as to convert the tree to the best advantage, and plumb them down upon the piece. When it is cut the first way, mark the length, bed, and place of the quarters, upon one of its sides, and strike a straight line upon one of its edges for the middle line of the bowsprit, which will likewise be the joint edge of the tree; then, in the wake of the bed, strike a parallel line, in distance equal to half the diameter of the bowsprit, and set off at each quarter, heel, and outer end, the sizes from the graduating batten, this will give the outside of the bowsprit, and the form of the trees. The same process must be gone through for the other tree.

To line the Side Fishes.

They are worked with the butt inwards. Strike upon the stick a straight line, and set off the length, quarter, and bed ; then from the main piece, take, upon the graduating batten, the sizes of the heel, head, bed, and quarters, and the difference will give the thickness of the fishes at these respective places.

ON A SYSTEMATIC

CLASSIFICATION OF MASTS, YARDS, ETC.

THE principles on which the position and moment of sails depend, have been shown in the preceding pages (see Arts. from 21 to 46); the proportions of the masts and yards, in relation to the length and breadth of the ship determined, in Articles from 47 to 92; and the diameters of these spars in relation to their lengths, from page 151 to page 165. It seems now desirable to introduce some systematic classification of the masts, yards, and sails of ships of war, by which the number of sizes required in the Navy might be reduced to a minimum. This has long been considered most desirable, not only for the English Navy, but by the French, that the store may be rendered capable of easily supplying the different spars that may be required in all the classes of ships. This difficulty has in a great degree been removed, by the new classification introduced into the British Navy; and Mr. Chatfield, in his "Elementary Essay on Masting Ships," has given a plan for "numerical distinctions," with a view to simplify the supply from the store and from one ship to another; but as such classification and plan give no rules for fixing them in relation to the stability of the ship, twelve systems have been formed, with their area and moment of sails correctly calculated to be compared with the stability of the ship, so that each class may have spars with dimensions determined in some relation to its power to carry sails. In order to accomplish this, it is essential that the moment of sail should bear some fixed relation to the stability of the ship, as ascertained by experience (see Art. 46, page 19). A comparison of the stabilities of a number of ships with their moment of sail, appears to be the most satisfactory way of ascertaining the extent to which the moment of sail may be carried, without exceeding the just limits fixed by the relative stability of the ship; whilst she may be masted up to her full power of carrying sail. This result may be ensured when the dimensions of masts and yards are determined in some relation to the stability.

The disadvantage of having no systematic method of masting ships, might be exemplified by reference to numerous facts relating to our ships of war, if such exemplification were needed. For instance, one ship is said to be crank, when the only fault is that her moment of sail is too great; and another is said to be a dull sailer, whilst this defect may be the result of a deficiency of power of sail in relation to the stability.*

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* It is here considered that the resistance of the bodies of ships is the same in relation to the stability, as a ship can only be said to be crank, when she has not power to carry sail in proportion to her resistance; it is by comparing these two points we can compare the relative excellence of different ships.

Now it is very practicable to provide a remedy capable of being applied to all classes of ships of war, which it is considered would be adequate to the requirements of the Navy; this would be, to have a sufficient number of systems of sails, with the moment or inclining force of one system varying from that of another in such a proportion that the fore-sails in one system may be suitable for the main-sails in a system adapted to a ship of a lower class; and the mizen-sails, suitable to the main-sails in a system adapted to a still lower class of ships. This arrangement might be made applicable to the top-sails and top-gallant sails; to the top-masts, top-gallant masts, and royal-masts; and to the lower, top-sail, top-gallant, and royal yards; and to the lower-masts, from the deck to the hounds. In the best masted ships the fore-mast is from .88 to .9 of the main-mast; and the mizen-mast from .68 to .7 of the main-mast. These are, at any rate, good proportions; and are very near the mean of the different proportions which have been customarily observed in the masting of ships, and as given, nearly, in the Tables in the preceding parts of this Work, from page 89 to 125. If, now, we take twelve systems of sails (Plate II., Fig. 3), each system removed from another in the regular gradation shown in the following Tables, we shall find by taking any number, for example the largest, No. 1, for the main of a first-class ship, the second below that, or No. 3, would be suited for the fore of the same ship, and five below, or No. 6, would be suited for the mizen. Or, if No. 3 were taken for the main, No. 5 would be the fore, and No. 8 the mizen. It would then be essential to find the moment and area of sail for each class, taking for the fore the second below the main, and for the mizen the fifth below the main; and having thus determined the moment of the sails, and knowing the stability of the ship to be masted, it remains only to take the moment that falls within the limits adapted to that stability. (See Examples in the following Tables.)

The twelve systems of sails described in Fig. 3, Plate II., and the Tables following, show the moments, with their respective lengths of lower-masts, top-masts, top-gallant masts, and yards, required to spread the sails. In these twelve systems there is sufficient variation to mast the whole Navy, as may be seen by the following examples. When therefore any construction is given, and the stability at 10° of inclination, to which all these examples are adjusted, if the two quantities of stability and moment of sail are brought into a proper relation to each other, and compared with tried ships, we may be certain of masting it to the proper power.

TABLE—*Giving the Dimensions of Masts for twelve Systems of Sails for Ships of War, with the Area and Moment of Sails they would give.*

Distinguishing No. of the System of Sails.	CLASS OF SHIPS	VARIABLE QUANTITIES.			LOWER-MASTS.						TOP-MASTS.						TOP GALLANT-MASTS.						ROYAL POLE.		
					Main.		Fore.		Mizen.		Main.		Fore.		Mizen.		Main.		Fore.		Mizen		Main	Fore.	Mizen
		Area of Sails.	Moment of Sails.	Height of Deck above water line.	Length from Deck to Hounds.	Diameter.	Length from Deck to Hounds.	Diameter.	Length from Deck to Hounds.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Hounded length.	Diameter.	Length.	Length.	Length.
	Ships.	feet.		feet.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.	feet	feet.	feet.
1	3-deck 1st class [1.	30253	2835786.	25.7	64.	42	56.3	38½	46.7	25½	65.4	22½	57.1	20½	46.5	16¾	33.6	12¾	29.3	11⅛	23.9	9	23.0	20.0	16.3
	2-deck 1st do. [2.	30935	27111121.	20.0	68.0	41	59.8	37½	49.6	25½															
2	3-deck 2nd do. [3.	26994	2403860.	24.7	63.0	40½	55.4	37¾	45.9	25½	61.1	22	53.3	19⅛	43.4	15⅝	31.4	12	27.4	10⅛	22.3	8½	21.5	18.7	15.2
	2-deck 2nd do. [2.	27830	2368179.	19.5	67.0	40	58.9	36½	48.9	25															
	2-deck 3rd do. [3.	26637	2202847.	18.3	62.0	37½	54.5	34½	45.2	24															
3	2-deck 4th do. [1.	24222	1918299.	18.0	62.0	37½	54.5	34½	45.2	24	57.1	20½	49.8	18	40.6	14⅛	29.3	11⅛	25.6	9¾	20.8	7⅜	20.0	17.4	14.2
	Frigs., 50 guns [2.	25153	1977259.	16.9	65.0	37½	58.5	34½	55.2	24															
	Razees .. ... [2.	25153	1917528.	13.0	65.0	37½	58.5	34½	55.2	24															
4	Frig., 1st class ..	21766	1553402.	13.0	61.0	34	54.9	30⅝	51.8	22¼	53.3	19⅛	46.5	16¾	37.9	13⅝	27.4	10⅜	23.9	9	19.5	7⅛	18.7	16.3	13.3
5	do. 2nd do. [1.	19293	1324422.	13.8	58·0	33	52.2	30¼	49.3	21¼	49.8	18	43.4	15⅜	35.5	12¾	25.6	9⅜	22.3	8½	18.2	7	17.4	15.2	12.4
	do. 3rd do. [2.	18764	1257670.	13.0	56.0	31⅝	50.4	27¾	47.6	20⅝															
6	do. 4th do.	16355	1013945.	12.0	52.0	29	46.8	26	44.2	19¼	46.5	16¾	40.6	14⅛	33.1	11⅞	23.9	9	20.8	7⅛	17.0	6½	16.3	14.2	11.6
7	do. 5th do.	14533	868729.	11.5	52.0	28	46.8	25½	44.2	19¼	43.4	15⅜	37.9	13⅝	30.9	11⅛	22.3	8½	19.5	7⅛	15.9	6⅛	15.2	13.3	10.8
8	do. 6th do. [1.	12831	742113.	11.5	49.0	26½	44.1	23¾	41.6	18¾	40.6	14⅜	35.5	12¾	28.8	10⅜	20.8	7⅛	18.2	7	15.0	5⅞	14.2	12.4	10.0
	Corv., 1st do. [1.	12947	680632.	5.9	50.0	24¼	45.0	22	42.5	18															
9	Corv., 2nd do. [1.	11039	538677.	5.0	46.0	22	41.4	19¼	39.1	17⅛	37.9	13⅛	33.1	11⅛	26.0	9⅛	19.5	7⅜	17.0	6½	14.0	5⅜	13.3	11.6	9.3
	Brigs, 1st do. [2.	11597	562261.	4.7	48.0	24	43.2	22	—	—	37.9	13⅛	37.9	13⅛	—	—	19.5	7⅛	19.5	7⅛	—	—	13.3	13.3	—
10	do. 2nd do.	10331	473312.	4.7	47.0	23⅛	42.3	21⅛	—	—	35.5	12¾	35.5	12¾	—	—	18.2	7	18.2	7	—	—	12.4	12.4	—
11	do. 3rd do.	8971	392499.	5.0	45.0	22⅛	40.5	20⅛	—	—	33.1	11⅛	33.1	11⅛	—	—	17.0	6⅛	17.0	6⅛	—	—	11.6	11.6	—
12	do. 4th do. [1.	8194	343232.	5.0	43.0	21¼	38.7	19⅛	—	—	30.9	11⅛	30.9	11⅛	—	—	15.9	6⅛	15.9	6⅛	—	—	10.8	10.8	—
	do. 5th do. [2.	7307	284983.	3.6	38.0	18⅛	34.2	17¼	—	—															

TABLE—*Giving the Dimensions of Yards for twelve Systems of Sails for Ships of War, with the Area and Moment of Sails they would give.*

Distinguishing No. of the System of Sails.	CLASS OF SHIPS.	LOWER YARDS.									TOP-SAIL YARDS.									TOP-GALLANT YARDS.									ROYAL YARDS.								
		Main.			Fore.			Cross-jacks.			Main.			Fore.			Mizen.			Main.			Fore.			Mizen.			Main.			Fore.			Mizen.		
		Whole Length	Spread of Sail	~~Whole Length~~	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter	Whole Length	Spread of Sail	Diameter
	Ships.	feet.	feet.	ins	ft.	ft.	ins.	ft.	ft.	ins.	ft.	ft.	ins.	f..	ft.	ins.	ft.	ft.	ins.	ft.	ft.	ins.	ft.	ft.	ins	ft	ft.	ins	ft.	ft.	ins	ft.	ft.	ins	ft.	ft	ins
1	3-deck 1st cls. [1. 2-deck 1st do. [2.	111.0	100.0	26½	96.0	86.5	22¾	77.2	69.6	18.	80.0	65.0	17⅝	69.2	56.2	14⅞	55.7	45.2	11¾	52.5	47.0	11	45.4	40.6	9½	36.5	32.7	7⅝	38.0	35.0	7⅞	32.8	30.2	6½	26.4	24.3	5⅜
2	3-deck 2nd do. [3. 2-deck 2nd do. [2. 2-deck 3rd do. [3.	103.2	93.0	24¾	89.3	80.4	21¾	71.8	64.7	16¾	74.4	60.4	15⅞	64.[illegible]	52.3	13⅞	51.8	42.1	10⅞	48.8	43.7	10¼	42.2	37.8	8⅞	34.0	30.4	7⅛	35.3	32.5	7⅛	30.5	28.1	6⅛	24.5	22.6	4⅞
3	2-deck 4th do. [1. Frig. of 50 guns [2. Razees ...... [2.	96.0	86.5	22¾	83.0	74.8	19¾	66.8	60.2	15½	69.2	56.2	14⅞	59.8	48.6	12¾	48.1	39.1	10¼	45.4	40.6	9½	39.3	35.1	8¼	31.6	28.3	6⅝	32.8	30.2	6½	28.4	26.1	5¾	22.8	21.0	4⅝
4	Frig., 1st class ..	89.3	80.4	21¼	77.2	69.6	18.	62.2	56.0	14½	64.3	52.3	13⅞	55.7	45.2	11¾	41.8	36.4	9⅜	42.2	37.8	8⅞	36.5	32.7	7⅛	29.4	26.3	6⅛	30.5	28.1	6⅛	26.4	24.3	5⅜	21.2	19.5	4¼
5	do. 2nd do. [1. do. 3rd do. [2.	83.0	74.8	19¾	71.8	64.7	16¾	57.8	52.1	13½	59.8	48.6	12¾	51.8	42.1	10⅞	41.6	33.8	8⅞	39.3	35.1	8¼	34.0	30.4	7⅛	27.3	24.4	5¾	28.4	26.1	5¾	24.5	22.6	4⅞	19.7	18.1	4
6	do. 4th do. ..	77.2	69.6	18.	66.8	60.2	15½	53.8	48.4	12½	55.7	45.2	11¾	48.1	39.1	10¼	38.7	31.5	8½	36.5	32.7	7⅛	31.6	28.3	6⅛	25.4	22.7	5⅜	26.4	24.3	5⅜	22.8	21.0	4⅛	18.4	16.8	3¾
7	do. 5th do. ..	71.8	64.7	16¾	62.2	56.0	14½	50.0	45.0	11¾	51.8	42.1	10⅞	44.8	36.4	9⅜	36.0	29.3	8¼	34.0	30.4	7⅛	29.4	26.3	6⅛	23.6	21.1	5	24.5	22.6	4⅞	21.2	19.5	4¼	17.1	15.6	3⅜
8	do. 6th do. [1. Corv., 1st do. [1.	66.8	60.2	15½	57.8	2.1	13½	46.5	41.9	10⅞	48.1	39.1	10¼	41.6	33.8	8⅞	33.5	27.2	7¾	31.6	28.3	6⅛	27.3	24.4	5¾	22.0	19.7	4¾	22.8	21.0	4⅝	19.7	18.1	4	15.9	14.5	3¼
9	Corv., 2nd do. [1.	62.2	56.0	14½	53.8	48.4	12½	43.2	39.0	10¼	44.8	36.4	9⅜	38.7	31.5	8½	31.1	25.8	7½	29.4	26.3	6⅛	25.4	22.7	5⅜	20.0	18.3	4½	21.2	19.5	4¼	18.4	16.8	3¾	14.7	13.4	3
	Brigs, 1st do. [2.	62.2	56.0	14½	62.2	56.0	14½	—	—	—	44.8	36.4	9⅜	44.8	36.4	9⅜	—	—	—	29.4	26.3	6⅛	29.4	26.3	6⅛	—	—	—	21.2	19.5	4¼	21.2	19.5	4¼	—	—	—
10	do. 2nd do. ..	57.8	52.1	13½	57.8	52.1	13½	—	—	—	41.6	33.8	8⅞	41.6	33.8	8⅞	—	—	—	27.3	24.4	5¾	27.3	24.4	5¾	—	—	—	19.7	18.1	4	19.7	18.1	4	—	—	—
11	do. 3rd do. ..	53.8	48.4	12½	53.8	48.4	12½	—	—	—	38.7	31.5	8½	38.7	31.5	8½	—	—	—	25.4	22.7	5⅝	25.4	22.7	5⅝	—	—	—	18.4	16.8	3¾	18.4	16.8	3¾	—	—	—
12	do. 4th do. [1. do. 5th do. [2.	50.0	45.0	11¾	50.0	45.0	11¾	—	—	—	36.0	29.3	8¼	36.0	29.3	8¼	—	—	—	23.6	21.1	5.	23.6	21.1	5.	—	—	—	17.1	15.6	3¼	17.1	15.6	3¼	—	—	—

TABLE—*Giving the Dimensions of Bowsprits, Jib-booms, Gaffs, and Driver-booms, for twelve Systems of Sails for Ships of War.*

Distinguishing No. of the System of Sails.	CLASS OF SHIPS.	BOWSPRITS.		JIB-BOOMS.		GAFFS.		DRIVER-BOOMS.	
		Length without board.	Diameter.	Length.	Diameter.	Length.	Diameter.	Length.	Diameter.
		feet.	ins.	feet.	ins.	feet.	ins.	feet.	ins.
1	Three-Deck Ships 1st class (1.)	52.5	40	54.0	16¼	50.0	12	71.0	15¾
	Two-deck ditto 1st ditto (2.)	52.5	40	54.0	16¾	50.0	12	71.0	15¾
2	Three-deck ditto 2nd ditto (1.)	50.5	38½	52.0	16⅛	48.0	11½	69.0	15¾
	Two-deck ditto 2nd ditto (2.)	50.5	38½	52.0	16⅛	48.0	11½	69.0	15¾
	Two-deck ditto 3rd ditto (3.)	48.2	36⅜	50.0	15½	46.0	11⅛	67.0	14¾
3	Two-deck ditto 4th ditto (1.)	46.0	35	48.0	14⅞	44.0	10½	63.0	13¾
	Frigates of 50 guns...... (2.)	46.0	35	48.0	14⅞	44.0	10½	67.0	14¾
	Razees .... (2.)	46.0	35	48.0	14⅞	44.0	10½	67.0	14½
4	Frigates 1st class	43.7	33¼	46.0	14¼	42.0	10	62.0	13⅝
5	ditto 2nd ditto ....(1.)	41.5	31½	44.0	13⅝	40.	9½	60.0	13¼
	ditto 3rd ditto........(2.)	39.2	29¾	42.0	13	38.0	9	58.0	12¾
6	ditto 4th ditto	37.0	28⅝	40.0	12½	36.0	8½	55.0	12½
7	ditto 5th ditto	34.7	26⅜	38.0	11¾	34.0	8	52.0	11½
8	ditto 6th ditto........(1.)	32.5	24¼	36.0	11⅛	32.0	7¾	50.0	11
	Corvettes, 1st class........ (2.)	32.5	24¼	36.0	11⅛	32.0	7¾	50.0	11
9	ditto 2nd ditto........(1.)	30.2	22⅞	34.0	10½	30.0	7¼	47.0	10½
	Brigs, 1st class .... (2.)	30.2	22⅞	34.0	10½	38.0	9¼	56.0	13
10	do. 2nd ditto	28.0	21¼	32.0	10	36.0	9	54.0	12½
11	do. 3rd ditto	25.0	19½	30.0	9½	34.0	8¾	52.0	12
12	do. 4th ditto.......... (1.)	23.5	17⅞	28.0	8¾	32.0	8¼	49.0	11
	do. 5th ditto .... (2.)	21.3	16¼	26.0	8	30.	8	45.0	10½

In determining the lengths and quantities, as given in the above Table, the lengths have been made to vary according to a rule that appears to be best adapted to the various stabilities of different classes of ships; and from the lengths determined, as given in the different columns for masts and yards, the moments of sails, as given in the first column, have been calculated. If the stabilities of ships had followed any general law of their principal dimensions, or of their force, a more definite rule could have been given. But it is hoped, that by substituting the quantities of any ship to be masted, the difficulty will be reduced, and the constructor enabled to select from the Table a class of masts and yards which will suit any ship, without the risk of her being improperly masted, in relation to her power to carry sail. In selecting a class from the Table for masting a ship, in which the same system of masts and yards is adapted to three-deck ships, and two-deck ships of the largest class,—and, again, for two-deck ships and frigates of the larger class, there will, on account of the higher sides above water, and a different length of lower-masts, be a different moment of sails. But this difference is provided for in the first columns in the Table, against the systems in which the moments vary under variable quantities; and as the moment of sail will vary from those given in the Table, according to the distance of the deck above the water-line, the correct moment of sail in any new construction, or in any ship to be masted, may be found by multiplying this difference into the area of sail; if the distance of the deck above the water-line be increased, the product must be added, but if it be diminished, the product must be substracted for the new moment. Thus, for example, in the third system the distance from the water-line is 18 feet, and the area of sails is 24222; now, let the height of the deck above the water-line in the new construction be 18.5 feet, then .5 × 24222 = 12111, the quantity to be added to the moment, as 1918299 + 12111 = 1930410; but if the distance of the deck from the water-line had been diminished by .5, this quantity would have been 1918299 – 12111 × 1906188.

As the moment of sails in terms of the stability is to determine the system of sails which should be selected for any ship, according to the stability of the ship, the lengths of the masts and yards given in the Table can also be tested, as to their suitableness, only by comparing the length of the yards in the Table with the length of the ship, and the length of the top-mast with the breadth of the ship; from this comparison it may be seen whether they fall within the limits of the terms that have been given to ships in which the masts and yards have answered well. The comparison of the main top-mast and lower-yard will be sufficient; since the whole of the masts and yards, except the lower-mast, bear a fixed relation to the main top-mast and lower-yard; and the sails in fig. 3, Plate II., are all similar figures.

In order readily to compare the lengths of the masts and yards given in the Table, with the length and breadth of the ship to be masted, as well as to see if their stabilities will fall under the proper terms when compared with the moments, the limits of each proportion, as well as the greatest and least terms when the moment of sails is divided by the stability, are given; observing that the greatest terms are in ships which have the most stability, even beyond what is certainly required for ships to be easy; and the least terms are in ships with the least stability in their class, and which it would be desirable to increase. The diameters of the different masts, yards, &c., are given in a correct relation to their respective masts and yards; but when it is considered expedient to have the main and fore top-masts of the same diameter, the diameter of the main must likewise be taken for the fore; but it is considered that this materially reduces the advantage of any system, as it regards one ship supplying another. The lengths of the heads of lower-masts and topmasts may be taken from the Tables (from page 89 to 125), in the same relation to the hounding.

THREE-DECK SHIPS.

Main-yards.

Greatest proportion .544 × the length of the gun-deck for the length of the main-yard. Least proportion .51 × the length of the gun-deck for the length of the main-yard.

Main Top-mast.

Greatest proportion 1.14 × the extreme breadth for the hounded length of the top-mast. Least proportion 1.05 × the extreme breadth for the hounded length of the top-mast.

Moment of Sails in terms of the Stability

$$\frac{\text{Moment of sail . . . .}}{\text{Moment of stability at } 10^\circ \text{ of inclination}} \quad \frac{3835786}{5931} = 478 \text{ largest.}$$

$$\frac{\text{Moment of sail . . . .}}{\text{Stability . . . .}} \quad \frac{263212}{3452} = 762 \text{ smallest.}$$

TWO-DECK SHIPS.

Main-yard.

Greatest proportion .545 × the length of the gun-deck for the length of the main-yard. Least proportion .51 × the length of the gun-deck for the length of the main-yard.

Main Top-mast.

Greatest proportion 1.17 × the extreme breadth for the hounded length of the top-mast. Least proportion 1.05 × the extreme breadth for the hounded length of the top-mast.

Moment of Sails in terms of the Stability.

$$\frac{\text{Moment of sail . . . .}}{\text{Stability . . . .}} \quad \frac{2368179}{5655} = 418 \text{ largest.}$$

$$\frac{\text{Moment of sail . . . .}}{\text{Stability . . . .}} \quad \frac{1750165}{2280} = 767 \text{ smallest.}$$

FRIGATES.

Lower-yards.

The greatest proportion .545 × the length on the lower deck for the length of the main-yard. Least proportion .527 × the length on the lower deck for the length of the main-yard.

Length of Top-mast.

Greatest proportion 1.22 × the extreme breadth for the hounded length of the top-mast. Least proportion 1.05 × the extreme breadth for the hounded length of the top-mast.

Moment of Sails in terms of the Stability.

$$\begin{array}{l} \text{Moment of sail} \ldots\ldots\ldots\ldots \\ \text{Stability} \ldots\ldots\ldots\ldots\ldots \end{array} \frac{1977259}{3715} = 532 \text{ largest.}$$

$$\begin{array}{l} \text{Moment of sail} \ldots\ldots\ldots\ldots \\ \text{Stability} \ldots\ldots\ldots\ldots\ldots \end{array} \frac{504750}{568} = 888 \text{ smallest.}$$

FLUSH-DECK VESSELS.

Lower-yards.

The greatest proportion .558 × the length of the main or upper deck for the length of the main-yard. The least proportion .541 × the length of the main or upper deck for the length of the main-yard.

Length of the Top-mast.

The greatest proportion 1.29 × the extreme breadth for the hounded length of the top-mast. The least proportion 1.16 × the extreme breadth for the hounded length of the top-mast.

Moment of Sails in terms of the Stability.

$$\begin{array}{l} \text{Moment of sail} \ldots\ldots\ldots\ldots \\ \text{Stability} \ldots\ldots\ldots\ldots\ldots \end{array} \frac{680632}{1069} = 636 \text{ largest.}$$

$$\begin{array}{l} \text{Moment of sail} \ldots\ldots\ldots\ldots \\ \text{Stability} \ldots\ldots\ldots\ldots\ldots \end{array} \frac{442413}{409} = 1081 \text{ smallest.}$$

THE PRACTICAL OPERATIONS

OF FORMING AND COMBINING THE

LOWER OR STANDING MASTS.

On Single-tree Masts.

THE length of the mast is now commonly given in heading and hounding, or from the deck to the stops; when this is not the case, the length of the housing of the mast and of the head is to be added for the entire length; but when the given length only is given, $\frac{1}{3}$ is to be added for an additional length of head; and the whole length of the head is $\frac{1}{6}$ of the given length for the main and fore masts, and $\frac{5}{36}$ for the mizen-masts when they step in the hold, and $\frac{11}{72}$ when they step on the lower deck. At the lower part of the head are the hounds or stops; the height from the step of the mast to the deck is then set up, which is called the housing, and determines the place for the partners, where the mast has the given diameter. From this place the mast is divided into four parts each way; for the partners to the heel for the lower quarters, at which places, and at the heel, hounds, and head, the different proportions of the given diameter are set off (page 164), and the mast is formed to them the fore-and-aft way, as given on the graduating batten; but athwartship it is made straight from the third upper quarter to the head, instead of preserving the proportion given at the hounds. All masts are first made square, and then such parts as are to be rounded, are formed into octagons, sexdecagons,* and so on, till they are made cylindrical.

Single-tree masts are left square below the stops $\frac{1}{18}$ of the given length, or $\frac{2}{5}$ of the mast-head for the hound pieces, and above once and a half the depth of the trestle-trees for the trestle-trees, &c.; but when the mast has long hounds pieces, it is left square $\frac{3}{4}$ of the length of the mast head. The mast head, above the lower part of the lower hoop, has its angles rounded off in an easy manner; for by making it cylindrical, a proper seating for the cap would not be obtained. The angles are first taken off to $\frac{1}{7}$ of the size of the mast head each way; and then the other angles formed are taken off to $\frac{1}{4}$ of the size of the squares, till they are reduced sufficiently small to form a fair curve with a plane; and below the square it is formed into the round, or what is called "hanced into it," with a hance about $\frac{5}{8}$ of the length of the hounds, below which it is made cylindrical; but sometimes a small champher only is taken off the mast head.

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* Commonly called by mast-makers eight squares and sixteen squares.

The stick, when appropriated, butted, and its defects examined, is placed upon the blocks upon which it is to be trimmed, when it is not straight, with its hollow side uppermost, which is made the after side; it is, however, more common to line the crooked way first, since if it will line this way, it will the straight. A part is then trimmed off on each side at the heels, partners, quarters, hounds, and head, till spine is obtained, the least possible appearance of which is sufficient; and from the parts thus trimmed off, the corresponding half diameters from the graduating batten, distances are set off from each side, and two spots made with chalk; the distance between these spots is called "play-wood," and gives the limits for striking the middle line, as by its passing between these spots, at every quarter &c., the mast may be clear of sap.

To square the stick to the dimensions of the mast, set off from the middle line at the quarters, heel, partners, hound, and head, the diameter from the graduating batten, at their corresponding places; then, with the right-hand to the mast, hold the line with the left, and strike lines through the spots, allowing it to pass through three spots, that the external form when the line is struck may be given correctly, and be fair.

Upon each end of the stick is drawn a vertical or plumb-line, that the mast-maker, while he is chopping it down by his plumb, may see that it is kept in its position. The mast is trimmed to its athwartship diameter first; and when the stick will work large enough this way, it is necessary to allow at the hounds, on each side, $1\frac{1}{2}$ inch wood, to raise the coaks; and although circular coaks weaken the mast, yet they are commonly used.

When the mast is formed the first way, the quarters, heel, partners, hound, and head, are marked on one of the sides already trimmed, and it is turned with that side upwards; it is then placed with the lines marked on the ends, for trimming the first way, perpendicular to a vertical line; and the same process is then gone through for obtaining the "play-wood," placing the middle line, setting off the diameters, and lining the mast as far as the first way.

The Hounds Pieces, x, y. (Fig. 18, Plate III.)

The hounds pieces, *a*, in single-tree masts are formed with the knees in one piece; they are in *thickness* half that of the trestle-trees, but never less than three inches; in *breadth*, they are the same as the mast head, with an addition for the breadth of the knee which is formed on the fore part for supporting the trestle-trees, the breadth of the knee being equal to the diameter of the top-mast, it may extend to the fore side of the fid hole; and their *length* is $\frac{2}{3}$ of the length of the head, without the additional length, or $\frac{1}{18}$ the given length of the mast.

In fig. 17, the mast heads are shown with oak cheeks; the knee, *z*, formed as common to single-tree masts. To this mast head is shown the fittings, as is common to brigantines' fore; *g*, the hoop and roller for horizontal stay; *h, h*, eye-bolts through the hoops, clenched on the fore side for peak hallyards; *c*, bolster; *d*, trestle-trees; *b, b*, cross-trees; *e, e*, battens on the mast head. Fig. 18 shows the fittings of the main-mast to brigantines, with the hounds pieces and knee in one piece; *a, a*, cross-trees; *b*, short cross-tree; *c*, the lower cap with an iron band; *d*, bolster; *e*, iron plate with an eye-bolt, *x*, for boom topping lift; *y*, eye-bolt for the fore brace; *g*, hoop and large eye for throat hallyards (this bolt is commonly fastened with a nut and screw at the fore part); *f, f, f*, mast head battens; *h, h, h*, eye-bolts through the hoops for peak hallyards; *n*, shive in mast head for top rope. The lower end is formed to a semicircle, and is reduced, or what is called "bearded," to half its thickness, and to half its breadth up, from which place the forming in of the lower end of the knee terminates. To bring the fore part of the knee nearer to the outer part of the trestle-trees, the after part of the hounds piece, on the side next the mast, is reduced from $\frac{5}{8}$ to $\frac{3}{4}$ of an inch, and their outsides are sometimes formed a little hollow to correspond; at other times the wood is taken from the mast to bring the fore part of the knee further out.

The hounds pieces are coaked to the mast either by two square coaks formed out of the mast, or by circular coaks; and are bolted with five through bolts, driven through from alternate sides, and clenched upon the opposite; they are placed, the two upper and two lower bolts, about $\frac{1}{5}$ the diameter of the mast head from the fore and after sides, the two upper bolts down about 9 inches from the stops, and the two lower $\frac{1}{3}$ the length of the hounds from the lower end; the other bolt is placed in the middle line of the mast, and at equal distances from the upper and lower bolts. A strengthening bolt is driven fore and aft through the knee and hounds piece, just above the two upper bolts; the lower end is nailed with about six nails, two inches from, and following the curve of the end: a hoop is, however, to be preferred on the lower end of the hounds piece, as the nails injure the mast. When the coaks are worked out of the solid, there are two in the middle line of the mast, the upper one is 5 inches down from the stops, and the lower one 4 inches below the upper; their breadth is in general $\frac{1}{4}$ the diameter of the mast, and their length $\frac{1}{3}$ the length of the hounds.

When the puttock shrouds are brought to the mast, either to a hoop, fig. 27, or to a chain, fig. 26, oak hounds pieces, fig. 47, are brought on the mast, and are $\frac{3}{4}$ of the length of the mast head, to give strength, and to prevent the hoop or chain from being drawn upwards by the tension of the top-mast shrouds. Their breadth at the upper part is equal to the distance between the after side of the mast, and the fore side of the top-mast fid hole; and out of this breadth the knee, *h*, is formed, on the fore part, the same as to the common hounds pieces. It is secured by five bolts and five coaks; and it has likewise three hoops driven upon it. The first hoop is placed $\frac{3}{16}$ of the length of the mast head down from the lower side of the trestle-trees, *a*; the second hoop $\frac{1}{6}$ of the length of the mast head below the lower side of the trestle-trees, so as to form a stop for the chain necklace, fig. 25, *b*, *b*, or hoop for the puttock shrouds, fig. 27; and the third hoop, which is commonly a clasp hoop, is placed 6 inches above the lower end of the hounds pieces.

In figs. 21 and 25, the fittings of the mast head and puttock shrouds are shown.

The hoop, fig. 27, was the plan at first used to bring the puttock shrouds to the mast, but it has since been considered that a chain, fig. 26, is preferable, as it brings less strain on the mast; this chain has shackles, *a*, *b*, fitted into the links to which the puttock shrouds are attached, *x*, *x*, *x*, *x*. The chain is brought tight on the mast by a screw, *d*, passing through the ears, *e*, *e*. When a hoop was fitted, the puttock shrouds were attached to it, as *x*, *f*, fig. 27, and kept separate by the bars, *e*, *e*, *e*, which likewise strengthened the hoop. This hoop was brought tight on the mast, in the same manner as the chain, by having two ears, *a*, *a*, and the screw *b*.

The fittings which are commonly fixed for the fore-mast heads of steam-vessels (fig. 21), and which form the cross-trees that are shown in fig. 22, have *a*, the trestle-trees; *b*, *b*, cross-trees; *c*, bolster; *d*, connecting piece, as shown by *d*, fig. 22; *f*, block fitted on the after side of the mast, as *f*, fig.

22, in which are two shives for throat hallyards; *g*, eye-bolt for slinging the fore-yard; *r*, *r*, *r*, eye-bolts for peak hallyards; *s*, *s*, battens on the mast head. The mast heads are left square, from the lower side of the trestle-trees to the upper side of the bolster.

Fig. 23, shows the fittings for the main-mast head of steamers: *a*, trestle-trees; *b*, *b*, the cross-trees; *c*, the bolster, which extends from the fore side of the mast to the chock, *g*, between the trestle-trees; *d*, block with two shives, as shown in *d*, fig. 24, for throat hallyards (this block is fastened to the trestle-trees with two bolts); *e*, plate and eye for the boom topping lift with two bolts; *x*, eye-bolt for the fore top-sail brace; *y*, eye-bolt for the fore brace; *m*, tenon for iron cap; *n*, shive in mast head for the top rope; *r*, *r*, *r*, eye-bolts for the peak hallyards (these bolts are in diameter for first class steamers 1½ inch, second class 1⅜ inch, third class 1¼ inch, and fourth class 1⅛ inch in diameter); A, iron plate round the mast for the chain rigging. The head of this mast is rounded, as shown by the section. The hounds are square, as shown by section *f*, *f*; the knee and hounds pieces are in one; they are fastened with three bolts, and a hoop at the lower part with two bolts through it.

Brigantines: fig. 17, the fore-mast, and fig. 18 the main-mast; both the fore and main masts have eye-bolts, *h*, *h*, *h*, for the peak hallyard, and the main-mast has an eye and outrigger for the throat hallyards, with a plate for the boom topping lift, *e*. The outrigger is 2½ by 3 inches deep, and its bolt through the mast is 1½ inch, and is secured with nut and screw at the point.

To Hoop the Mast.

Hoops are placed upon single-tree masts, in general, both at the head and heel; at the head about five in number, and from one to three at the heel. The number and place of those at the head should be determined by the knots, placing the upper one as near to the tenon for the cap as possible; and the lower side of the lower one, once and a half the depth of the trestle-trees from the stops, or to what is called the "calf's tongue;" but if there are knots, they may be removed 4 or 5 inches to cover them. One, two, or three, are placed between these, according to the knots in the mast head, and fixed over those that are the worst collared. Knots are badly collared, when the fibres that take a sinuous form round them are separated.

The hoops at the heel are placed with the lowest about 14 inches from the heel, or as near the shoulder as possible; and if the heel should be shaken, two others are placed above it, from 2½ feet to 3 feet apart; if the heel is sound, one only is placed upon it.

Single-tree Masts cheeked. (Fig. 28, Plate III.)

Single-tree masts are cheeked to give additional strength, or to take off that part of the top end of the tree which is frequently knotty, or will not work to its full size. Fore-masts from 18½ inches and upwards in diameter are in general cheeked. To cheek a mast causes a great consumption of timber, as one of 22 inches in diameter will take for the cheeks the greatest part of a 19-inch tree, when timber is not supplied for cheek pieces; but when they are cheeked, in most cases, especially those above 19½ inches in diameter, they may be made of yellow pine timber, as red pine seldom exceeds this dimension; and this would reduce the expense. When the top ends of Riga sticks have the knots too bad to make top-masts, it is then good conversion to cheek them for standing masts.

The main-mast of brigs, when they have no try-sail mast, must be got without cheeks, on account of the working of the gaff. Single-tree masts, when they are cheeked, have the proportions set off, and are formed the same the athwartship-way as those without cheeks; but the fore-and-aft way from the lower end, or tail of the cheek, to the upper end, they are made straight, so as to be at the tongue or head from $\frac{4}{17}$ to $\frac{1}{4}$ of the given diameter. In lining the stick the athwartship-way, the line is in general carried through to the quarter above the tail of the cheek, that the mast may be fair; then at the tail or lower end of the cheek $\frac{3}{40}$ of the diameter of the mast is set in for the curvature that will be formed in the breadth of the cheek, and from this spot to the head, where it is $\frac{1}{4}$ or $\frac{4}{17}$ of the diameter, a straight line is struck, to which line the mast is trimmed through for the seating of the cheek; only that another line is struck from the exterior of the mast, at the tail of the cheek, to intersect this line at 6 feet up, or to the third quarter, where the round of the mast will terminate.

On the Cheeks.

The cheeks are brought on each side of the mast, and extend down from the head half of the given length, besides the additional length of head; they have the sides that fay to the mast straight lengthways, and are in thickness at the lower end $\frac{5}{27}$, at the hounds $\frac{9}{37}$, and at the head $\frac{1}{4}$ or $\frac{4}{17}$ of the given diameter; the length of the head and the place of the hounds are determined as they are for single-tree masts, at the hounds half the thickness of the trestle-trees is set without the proportion for this place, to form the stops; they are straight lengthways, from the lower part of the stops to the lower end, and from the hounds to the head.

The cheeks are of the same breadth as the mast the fore-and-aft way, from the head to the lower part of the hounds; from this place they are made straight to the lower end or tail, where they are in breadth 1 inch more than half the given diameter. In the same manner, and at the same distance above the stops, the cheeks are rounded, and the length of the hounds and hance is the same as of masts that head themselves; but below the hance they are rounded transversely, to a margin upon their edge, which is up from the sole or faying surface $\frac{2}{7}$ of its thickness at the lower end, and $\frac{5}{12}$ at the hance; except when the masts are fished on the fore part, which is often done when single-tree masts are considered weak, and are fished on the fore side, to increase the strength, when the outer surface of the fish and cheek are made to a fair curve for hooping.* The lower end of the cheek is rounded to a semicircle, and the margin is carried round the end, to which it is bearded.

To hoop the Cheeks, and place the Circular Coaks.

The first hoop is placed $\frac{1}{2}$ an inch below the stops, which is called the hound hoop, *h*; one with its lower part once and a half the depth of the trestle-trees above the stops, and two at the head, one about 3 inches below the tenon, and the other 2 inches below it; but this is not always the case, frequently there is only one hoop. Between the upper hoop, and the one above the stops, to a mast of 23 inches in diameter, three hoops are placed; from 23 to 30 inches diameter, four; from 30 to 33 inches, five; and from 33 inches and upwards in diameter, six, at equal distances apart. At the lower end of the knee, a second hound hoop, *h, h*, is driven on, and below the hounds the hoops are made to clasp, as it would be impracticable to drive them; they have sometimes a joint which is placed on the after side of the mast, but mostly the spring of the iron is sufficient to allow them to open, and on the fore side with the two parts to clasp each other with mortices, which have wedge-like keys driven in to set them tight; this is not applicable to single-tree masts, as there is then insufficient tapering to give the necessary drift for the hoops to be driven on. These keys, when hot, are formed close to the mast, and are generally covered with lead, to prevent any ropes from catching under them when there is not a rubbing paunch; one is placed from 20 to 21 inches below the lower part of the hounds, and the lower one about 12 or 14 inches above the tail of the cheek; between these, three or four others are placed at equal distances.

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* See Fishing of Masts.

The circular coaks are placed in the mast head above the stops, one between each hoop, upon alternate edges, about their diameter from the edge of the cheek; in the wake of the hounds three coaks on each side, one about 9 inches from the stops, and one about 9 inches from the lower part of the hounds, on opposite edges upon opposite sides; one on each side is placed in the centre immediately opposite each other, so that four bolts of the five that are driven through the hounds, pass through one coak each, and the other bolt, the centre one, through the two coaks that are opposite each other; and below the hounds they are from 2 feet to 2 feet 6 inches apart; the lower coak is about 9 inches above the part at which the cheek is hollowed.

To Bolt the Cheeks.

One through bolt is driven through each circular coak, except through those coaks in the round of the mast where the bolts are driven through diagonally from alternate sides. In the mast head one through bolt is driven between each hoop, through the circular coaks; and as high up as the cheek is hollowed, bolts are driven through, about 3 feet 6 inches apart, in a diagonal direction, so as to be on the fore edge of one cheek and on the after edge of the other. In the wake of the hounds, the bolts are driven from alternate sides; two of these bolts, passing through the side plates, are clenched.

On Made-masts. (Fig. 1., Plate IV.)

To confine a mast-maker too rigidly to any particular plan in the making of masts, is likely both to increase the expense of making them, and to occasion a needless delay; since there is not always in store a supply of sticks suited to a particular plan of mast-making. It would, therefore, be advantageous to impose certain restrictions with regard to placing the scarphs, butts, &c., and leave the mast-maker to appropriate such sticks as he can, from time to time, obtain from store, in the best manner he is able. As it regards efficiency of strength the principal pieces in a mast are the cheeks; since the wringing of the mast head is the most common defect; and the want of them has constituted the principal imperfection in masts formed on Sir Robert Seppings's plan. We find no complaint of these masts, even where there are two butts of the component parts in the same transverse section; hence it may be fairly concluded, that if the scarphs which are commonly given to masts are of a sufficient length, and the butts well hooped; and when there are more scarphs than one, if they are placed properly with regard to their distance from each other, they do not materially affect the strength of the mast. These scarphs should, however, be from 6 to 7 feet long, so as to take three hoops, one over each butt, and one in the middle of the scarph.

Several plans are given for the appropriation of the different sticks that are commonly furnished for the store of masts, all of which appear to be characterised by efficiency of strength; whilst they would be less expensive than the common made-masts when large trees are used. The saving of expense is not, however, the object which is here aimed at, so much as the removal of the inconvenience that is occasioned by the difficulty of procuring large sticks. The explanation of each plan is given as follows:

Common Made-masts. (Fig. 1, Plate IV.)

The common made-mast is composed of five principal pieces: the ***spindle***, *c*, *c*, which is frequently made of two pieces, as *m*, *m*; the ***side-trees***, *b*, *b*; the *fore and after fishes*, *d*, *d*; and the *cheeks*, *a*, *a*. The several pieces which compose the mast have the same external form as single-tree masts that are cheeked.

The spindle, *c*, *c*, which is the principal or main piece, extends from the head to a small distance below the wedges of the middle deck, in three-deck ships; and the upper deck in all others, if a piece can be provided long enough; if not, the side-trees where they meet may run higher up. It is the whole size of the mast, the fore-and-aft way, from the head to the first clasp hoop, where an abutment is sunk $1\frac{1}{2}$ inch, for the fore and after fishes, *d*, *d*; 3 feet below the abutment it is $\frac{11}{18}$ of the given diameter, and from thence to the lower end (where it is half the given diameter) it is straight. Athwartships, the spindle is at the head, from $\frac{4}{17}$ to $\frac{1}{4}$; at the upper end of the side-trees, or at the second clasp hoop, $\frac{7}{13}$ of the given diameter, and at the tongue, or lower end, $2\frac{1}{2}$ inches; between which places it is straight.

The side-trees, *b*, *b*, are brought upon the sides of the spindle; making up with the spindle, from its lower end upwards, the athwartship diameter of the mast; below the lower end of the spindle, they meet at the middle line, and are of themselves to the heel, the whole diameter athwartship; fore-and-aft ways, they conform to the size of the spindle, as far down as it extends; and below it they are parallel.

The fore and after fishes, *d, d,* are brought on the fore and after sides of the mast, and extend from the heel up to the first or upper clasp hoop, if the trees are of sufficient length; if they are not, a piece is scarphed on the lower end; the thickness of the fish makes up the fore-and-aft diameter of the mast, and the breadth of the fishes is as wide as it can be obtained; the deficiency is made up by pieces called "aris pieces."

To form and unite the several Pieces. (Fig. 1, Plate IV.)

The spindle, *c, c,* is worked with the butt-end of the tree upwards. The middle line, or a line to be in the same plane with the axis of the mast, is got upon the spindle for setting-off equally on each side the several diameters. The lengths of the head for the stops, the hounds, and the place of the lower end of the cheeks, are determined the same as for single-tree masts. To form it the athwartship-way from the head, where it is from $\frac{4}{17}$ to $\frac{1}{4}$ of the given diameter, to the upper end of the side-trees, which is at the second clasp hoop, its side is made to tend in a direct line to the diameter of the mast, at the lower end of the cheek, or to be $\frac{7}{13}$ at the second class hoop; and from this place it is straight to the lower end, or tongue, where it is $2\frac{1}{2}$ inches.

To form the spindle the fore-and-aft way, it is made the whole size of the mast, from the head, to 21 inches below the lower part of the hounds, which is the place of the upper clasp hoop, and the upper end of the fore and after fishes; this is obtained by setting off $\frac{3}{5}$ of the given diameter at the head, and making it straight to the proportion of the third quarter, which is got by the graduating batten; at 3 feet below the first clasp hoop it is $\frac{11}{18}$ of the given diameter; from which place it is straight to the lower end, where it is one-half the given diameter. The spindle is lined, as explained before, and the faying surfaces to receive the side-trees are trimmed through straight, by lining both sides.

The side-trees, *b, b,* are worked with the butt-end downwards; upon them are set off the upper and lower quarters, the lower end of spindle, and of the partners, and their whole length; as these pieces meet at the middle, and give the whole size of the mast below the spindle. The middle line, or axis for the athwartship-way, will be a line produced from the joint or part where they meet; from this line for the outsides will be the given proportions, as on the graduating batten; and from the lower end of the spindle to the upper end, they are made straight, to half the size of the spindle from the middle line. The fore-and-aft way they are made to the size of the spindle, as far as it extends, and below it, they are of a parallel breadth. The side-trees are lined on both sides, and trimmed through straight, and out of winding, on the surface that fays to the spindle, and the part that forms the exterior part of the mast.

When the side-trees and spindle are united together, the mast is trimmed with one of its sides upwards, and the spindle and side-trees lined to their fore and aft dimensions, and the lines taken out; the mast is then turned over and lined on the opposite side, and the spindle and side-trees trimmed through straight when they are united together.

The fore and after fishes, *d, d,* are worked with the butt-end downwards; they are brought on the fore and after part of the mast, and make up the fore-and-aft diameter. Their thickness will be the difference of the diameter of the spindle, taken from the whole diameters at the several quarters; and their proper thickness is obtained by setting off the partners, and upper and lower quarters, upon them; and, as the side that *fays* to the side-trees and spindle is straight, to conform to these pieces, the difference is set off with the graduating batten, and outer parts of the fishes are formed to it. The fishes are set straight, and lined on both edges, and their faying surfaces and outsides trimmed straight and out of winding; they are then brought on, and dowelled and bolted to the mast, when the mast is eight-squared and rounded, as described for single-tree masts cheeked.

To unite the Pieces that compose the Made-mast.

The spindle, when in two, which is frequently the case, is formed the fore-and-aft way, by the union of the two pieces, at the athwartship middle line, *m m.* These pieces are united together by circular coaks, at the middle line, about 5 feet apart, between the hoops, and a bolt is driven through each coak, which is left an inch and a half short at each end. The circular coaks diminish in size, from 5 to 2½ inches in diameter, as they approach the tongue.

The side-trees, *b, b,* are brought upon the spindle; they are coaked to it with one circular coak, about 9 inches above each hoop, placed alternately upon opposite edges, or opposite sides, and bolted with one bolt through each coak, driven through from the side on which the coak is placed.

The fore and after fishes, *d, d,* are coaked to the mast with one circular coak under each hoop, and as far up as the substance of the side-trees will admit; they are placed alternately in each, so as not to be nearer than their diameter to the edge of the fish; above, they are placed in the spindle, alternately on each side of the middle line, increasing in distance from it as the spindle widens. They are bolted with one through bolt in each coak. The aris pieces, that make up the deficiency of the fishes, are sometimes nailed with about two nails between each hoop, at other times they are fastened with small pegs.

Occasionally a slight alteration is made from the common made-masts, in order to render the conversions of the sticks more advantageous. In one case the spindle is made in two parts, with the sticks $\frac{1}{6}$ less in diameter than when it is made in one; and in such proportion as the trees are shorter, in consequence of using smaller sticks, the side-trees are carried up to compensate for the deficient length, and are scarphed at the heel to make up the length by a lengthening piece, having a scarph about 6 feet long secured with three hoops, three bolts, and three coaks. This alteration in a 40-inch mast would require two 25-inch trees, instead of one tree 30 inches in diameter; and as the 25-inch trees would be 15 feet shorter than the 30-inch trees, the spindle is shortened, and the side-trees are lengthened in the same proportion. In the other case, the spindles are shortened, as in the first case; but in the fore-and-aft way they are made to the full size of the mast, as far down as the sticks will hold that size; and at this extremity the butt for the fore and after fishes is worked, which so shortens the fishes that they do not require to be lengthened at the heel. The side-trees are lengthened as in the first case.

On the Top and Butt Masts. (Fig. 27, Plate IV.)

The top and butt masts are generally made between 24 and 32 inches in diameter. The main pieces, *b b*, which form the mast the fore-and-aft way, are made in two parts; the butt-end of the upper main piece is placed upwards, and the butt-end of the lower main piece is placed downwards. The lower main pieces work into the upper main pieces with a butt, *e*, of about 2 inches,—in general, under the lower bound hoop; the upper main pieces extend down as low as the length of the stick admits, and the deficiency is supplied by a lengthening piece with a scarph of 6 feet in a 32-inch mast, and 5 feet in a 24-inch mast. The scarph has three coaks and three bolts in it; and when the mast is hooped, three hoops are brought over the scarph. The inner butt of the scarph should, if possible, always be brought below the upper wedging deck. The fishes, *a a*, are brought on the side of the mast, and stop at the third quarter, making up with the spindle, or main pieces, the athwartship diameter of the mast, and extend down to the heel of the mast. The main pieces, or spindle, are, athwartships, half the diameter of the mast; and the two fishes make up the other half. To form an abutment for the upper end of the fish, a line is drawn from a spot half-way between the third quarter and the hounds; and at this place the half diameter is set off; and from this spot to the head, where it is $\frac{4}{17}$ of the size of the head, it is made straight. This line is then carried straight down to the third quarter, where it forms an abutment for the end of the fish, and will allow the fish to project as much as the cheeks, *d d*, at the lower part are hollowed.

Made-mast. (Fig. 31, Plate IV.)

This mast is made with a short spindle, consisting of one part only, *b*; two side-trees, *a a*, lengthened, *g g*; two fore-and-after fishes, *c c*, lengthened, *d d*; and cheeks, *b b*, as in the common mast. It is necessary that the stick used for the spindle should be as straight as possible, and full at the upper end—as the full size of the tree will be required at the angle, *i i*.

This mast is put together very similarly to the common made-masts, except when the stick will not hold its full size the fore-and-aft way, in which case a piece, *m m*, is brought on the after and fore sides to make up the deficiency. This piece extends from the head to the lower hounds hoop, where it forms an abutment for the fore and after fishes. As the spindle is shorter in this mast than in the common made-mast, the side-trees are made to extend $\frac{1}{4}$ the length of the mast head above the third quarter, that they may give a sufficient scarph to the spindle. At the head the spindle is made $\frac{4}{17}$, and at $\frac{1}{4}$ the length of the mast head above the third quarter, it is $\frac{4}{7}$ of the given diameter; from this spot upwards the spindle is straight to the $\frac{4}{17}$, and downwards to $\frac{3}{17}$ of the given diameter. The side-trees, *a a*, make up the athwartship diameter of the mast. And the length is made up by lengthening pieces, *g g*, joined with a scarph, *e e*, which takes five hoops, and is coaked with five coaks in each, and bolted with four bolts to pass through both scarphs. The fishes have likewise lengthening pieces, *d d*, of which the upper butt is just below the wedging deck; and three hoops are brought over these scarphs. Whilst the disposition of the parts of this mast give it an increase of strength in comparison with the common mast, there will also, if the spindle is in two parts, be a saving of one 25-inch tree when the mast is 40 inches in diameter.

Made-mast. (Fig. 29, Plate IV.)

This mast is made of a short spindle, *b*; the side-trees, which form the fishes, consist of four principal pieces, *a a*; and the cheeks, *c c*. The spindle extends downwards from the head as far as the length of the sticks will admit. The upper end is athwartships $\frac{4}{17}$ of the diameter; and fore-and-aft it forms the whole diameter of the mast, as far down as this size can be obtained from the stick. To ¼ of the length of the head above the third quarter, it is $\frac{4}{7}$ of the given diameter; and at this place terminate the side-trees, *a a*. The lower end of the spindle, *e*, is the athwartship-way $\frac{3}{17}$ of the given diameter; and fore-and-aft it is as wide as the tree will work: from the touch to ¾ the length of the mast head the spindle is made straight each way. The side-trees, *a a*, are made of four pieces; and at the place where the spindle falls off the *fore-and-aft way, g g,* they are so formed as to be under a hoop, *i i;* the side-trees work in with a butt of about 2 inches, and the athwartship-way they extend up on each side of the spindle ¼ the length of the mast head above the third quarter, *a a*, where they have a butt which projects as much as the cheek is hollowed in their breadth at the lower end. And care should always be taken to have sufficient wood for the scarph of the side-trees to work to the middle line at the part where the spindle becomes deficient in size the fore-and-aft way, and where they will cave or rabbet over, so as to meet at the middle line. In forming the four sticks which make up the side-trees or body of the mast, two for each side-tree are first well jointed by being turned straight and out of winding; the wood is then taken off,—working from the middle line or axis of the mast to make the scarph on the spindle each way.

The scarphs for the lengthening pieces at the lower end of the side-trees or body of the mast, require to be about 8 feet 6 inches long; the butt of the lower end of the side-trees athwartships being $\frac{4}{13}$ of the given diameter; the upper butt ½ of the lower butt, and billed in 2½ inches. This scarph is secured with six coaks on each side, and six through bolts; and four of the heel hoops are brought over it, so that one shall come on each butt. The butt-ends of the trees for the spindle are worked upwards, and for the side-trees they are worked downwards. The cheeks are worked in the same way as for made-masts.

On Made-masts. (Fig. 28, Plate IV.)

This mast is formed with a view of using smaller and shorter sticks than those which are used in the common made-masts, when it is necessary; and for increasing the convenience of conveying them from one port to another. And although it may be less rigid than the masts which have been already explained, yet it will be efficient, and capable of bearing all the stresses to which lower-masts are subject. It is composed of five principal trees and the cheeks; the principal trees are scarphed together with scarphs, *c*, in length about 6 feet, so that three hoops may come over the scarph. When the principal trees are united together they form the whole diameter of the mast the fore-and-aft way; but cheeks, *a*, are brought on the athwartship-way, and the fore pieces which form the mast this way have an abutment formed, *a a*, at ¼ the length of the mast head above the third quarter, which projects as much as the cheeks are hollowed in their breadth. And from this point it is made straight to the head, where it is $\frac{4}{17}$ of the given diameter. The cheeks are formed in the same way as those to common masts.

On Made-masts. (Fig. 30, Plate IV.)

This mast is formed with the same view as that which is described in fig. 28. The spindle or core of this mast is composed of four pieces which together make ¼ the size of the mast the whole length, scarphed or butted, placing the scarphs or butts so that they shall not be within two stations of each other, or of the other butts or scarphs of the mast. But should the different lengths of the core abut against each other, a circular coak 2 feet long should be placed in each end. Four fishes are brought upon the core or main pieces at the fore and after sides, and on each side of the mast; the side fishes extending up to the third quarter, where they project as much as the end of the cheek is hollowed in its breadth. The fore and after fishes terminate at the station of one hoop beyond the side pair, where they likewise have an abutment for the cheeks that are brought on the fore and after sides. Cheeks are brought on both the sides, *e e*, and on the fore and after parts of the masts, *m m*; those on the sides are formed in the same manner as the cheeks to the common masts; but those on the fore and after parts of the masts fill up the breadth between the two side cheeks, *m′*, but increasing in breadth to the lower end, *n*, so that the breadth at this place shall be equal to ½ the given diameter of the mast. When the mast becomes weak, a front fish may be scarphed on to the lower end of the foremost cheek; the scarph taking two hoops, and the lower end of it extending down below the first wedging deck. The fishes are scarphed with flat scarphs below the wedging decks, as shown by *o* and *p*.

In forming the different made-masts, as shown in figs. 27, 28, 29, 30, and 31, the common mode of hooping, coaking, and bolting is to be observed. The diameter of the fastening bolts should not, however, exceed ⅞ of an inch for large masts, nor ¾ of an inch for small masts; as when a mast is taken apart for repair, the bolts must necessarily be increased, since their only use is that of combining the different parts until the mast is hooped. The hounds bolts form an exception to the general statement; the sizes of which are given in the Tables.

FIG. 42.—PLATE IV.

Made-masts, according to the Plan of Sir Robert Seppings.

The new made-mast is composed of a number of square pieces, each side being one-fourth the diameter of the mast, for ships of 60 guns and upwards; and one-third the diameter for smaller ships. These pieces vary in length according to the length of the mast, and are placed end to end, with their butts under the hoops. Four of these pieces, in a sufficient number of lengths to make up the length of the mast, are first united together to make the main piece, or what is called the core B; on each of the four sides of which, two pieces are united together, and brought upon it to make up the diameter. The pair on each side, *a*, and the after pair, *d*, extend the whole length of the mast; the pair on the fore side, *c*, does not extend the whole length of the mast, but is shorter at each end by the length of the mast head, *minus* once and a half the depth of the trestle-trees.

These masts are formed with both ends alike, to afford an opportunity, in case of defect or injury, of placing either end uppermost; each end is therefore made to form the head, and of a length the same as the common mast head.

The exterior form of the body of these masts is cylindrical; the parts at each end, to the length of the common mast head, are formed with the angles only taken off, the same as the common heads.

New Made-masts for Ships of the Line.

The several pieces that make the masts, are placed with their butts under the hoops. For ships of 60 guns and upwards, the length of the pieces, and the places of the butts, are determined by dividing the length of the fore fish into fourteen equal parts, which gives the station for every other hoop, with one placed at the middle of the mast. At the middle will be the station of one butt, and its opposite on opposite quarters. The lengths of the middle pieces are equal to six of these spaces; but the pieces which run through to the ends may be longer or shorter, according to the convenience of providing them.

The first butt in the fore and after pair is placed under the middle hoop in one piece, and the opposite on the opposite quarter; and the other two pieces in these pairs extend from the top of the third space above, to the bottom of the third space below the middle, so as to bring the butts to the middle of each piece. To the two side pairs, one butt and its opposite, on the opposite quarter, are placed one space from the middle, while the butt of the other piece is placed at two spaces on the other side of the middle.

The main assemblage, or core, fig. 42, B, has the butts the same, in relation to the middle hoop, as the side pairs; that is, the butts are at the corresponding spaces on the opposite side of the middle of the mast lengthways.

When the first butts from the middle are determined, the others will run regularly six spaces from them, except those lengths that run through to each end. The pieces are trimmed and planed up to their dimensions; the core is then put together. To bring the pieces that make up the different lengths in a direct line, several blocks or skids, sufficient to take the length of the mast, are placed in the same plane, at distances from each other, so as to take the butts. The different pieces have their butts made square, and are brought together according to their shift; and when in a direct line upon the skids, an account is taken for the coaks, according to the common method, and the butts are coaked with one coak in each, 3 inches in diameter, and 6 inches in length. To bring the butts in the several lengths in the four parts that make the core into close contact at their abutments, a force is brought upon the ends of the mast, by means of a set by wedges at each end, against some part of the mast-house, or any place at which sufficient support can be obtained; and that the four parts may be closely united, sets to *wrain staves* are made to each skid one way, and brought together by clamps the other way. When the pieces that form the core are brought together, they are united by tree-nails, about 2 feet apart, commencing 6 inches from the butts, driven from one angle to the opposite, with those in the opposite diagonal placed at the same distances; but to pass in the middle between them.

The pieces that form the side, and fore and after pairs, are first coaked and bolted together in pairs, before they are fixed to the core. Each length or piece is divided into twelve equal parts, which give the spaces for thirteen bolts, one under each hoop; but in the situation of the one that would fall opposite to the butt, there are two bolts, placed about 12 inches on each side of the butt; these bolts are placed at equal distances from the edges: and a coak of 3 inches in diameter, and 3 inches long, for every other bolt to pass through. The coaks that fix them to the core, are placed one on each side, at 12 inches from the butts of the core in one piece; and one about 7 inches from the same butt in the other piece of the pair; there is one likewise 12 inches from each butt of the different pairs, and one between each hoop when they are in place.

The pairs are united to each other, and to the core, by through bolts, that pass from one pair to the opposite. These bolts are driven in a diagonal direction, fig. 12, C, so as to be 3 inches from the edges of the pairs on opposite sides, or opposite quarters. They are between each hoop, one to unite the fore and after pairs, and one the side pairs, keeping them clear of the butts and dowels.

To make up the deficiency that is left by the breadth of the pairs to give the form of the mast, aris pieces, or ekings, fig. 12, *d d*, are brought in the spaces between the edges. These pieces have their butts placed under the hoops, so as to give shift to the butts of the pairs, or to correspond with the butts of the core; they are fastened with mixed metal screws, 8 inches long, between hoops in every alternate space, and one a foot from each butt, passing into the edges of the pairs nearly square to the surface, or in a direction so as to draw a little to the other seating.

The hoops on the body are spaced as described in shifting the butts; that is, one hoop over, and one between, every butt, with one about 3 inches from each end of the foremost pair, and one at the hounds. The head hoops are spaced with one against the end of the foremost pair, or once and a half the depth of the trestle-trees above the hounds; one 3 inches below the tenon of the cap; and four at equal distances between.

The body hoops are screw hoops in two equal parts, with the ears for the screw on each side of the mast. To cover the ears and screw, so as to prevent ropes from catching, a piece of fir 6 inches thick, and 9 inches wide, is brought upon the side of the mast, and let over them.

The masts that of late have been formed on this plan, have had all the bolts and circular coaks, except those in the butts, left out, and treenails used in their place. The pieces that form the core are united by treenails as heretofore, 2 feet apart, and commencing at 6 inches from each butt, fig. 12, D and E; and fig. 11, *d*, *n*. When the core is together, the side pairs are brought against it in their proper position, and the treenails driven; those in the edges, fig. 12, C, that unite the pieces into pairs, first; and then those that combine them with the core, fig. 12, A. The treenails in the edges, that unite the pieces into pairs, are placed opposite the middle of the distance between the treenails and the core, in every alternate space; and the treenails that unite the side pairs to the core, in the intermediate spaces, one in each piece of the pair, to pass through both pairs and the core. The treenails in the fore and after pairs which pass through the edges are placed opposite to those that unite the side pairs to the core; and those that unite the fore and after pair to the core, fig. 12, A, opposite to those in the edges of the side pair. This gives the treenails at the distances of about every 6 inches: those in one diagonal of the core, fig. 12, D; those in the edges of the side pairs, fig. 12, C; and those that pass through the fore and aft pair and core, fig. 12, A and C; those in the opposite diagonal of the core, fig. 12, D; and then those on the edges of the fore and after pair, and those that unite the side pair to the core, fig. 12, A. The treenails, except those in the core, are always placed in the middle of the pieces, in relation to the edges; those in the core are 1½ inch; side and fore and after pairs, 1⅝ inch; and those in the edges, 1¼ inch. In the heads, in addition to the treenails, there are six ⅞-bolts, that pass through the side pairs and core, and fore and after pairs and core, between the hoops.

The form of this mast for ships of the line was modified, and its strength increased, by Mr. Blake, master shipwright of Portsmouth Dockyard. One of Sir Robert Seppings's masts had the side pairs taken off, and side fishes added. These were formed, at the upper part of the common made-mast, so as to receive the cheeks in the way that they are applied to these masts, and as shown by the dotted lines, *a*, fig. 2, plate IV. The hoops on these masts are not made with screws; they are drift hoops, and are driven on in the common way. A mast formed in this manner was supplied as the fore-mast of the *Revenge* of 78 guns; it was in this ship several years at sea, in which it was found to answer well, and after she was paid off, in 1840, its strength was found to be without any defect, and it was returned to the store serviceable. The fishes for a 35-inch mast may be made either from a 26-inch tree, or from a bowsprit that is over-length. The cheeks are made and united in the same way as those to common masts.

Frigate's new Made-mast. (Fig. 3, Plate IV.)

When the length of the head is set off at each end of the masts of frigates, the remainder, or body of the mast, is divided into eighteen equal parts, giving nineteen stations for the hoops and butts. To give the butts their proper shift, the first butt is placed for the *after fish*, at the middle station; for the *core* at the station six spaces above the middle; for the *fore fish*, four spaces; for one *side fish*, two spaces above, and for the other *side fish*, two spaces below, the middle; and then from every butt ten spaces or parts are set off for the length of each piece, and for the places of the other butts, which for the core and fishes will be two spaces apart. For the butts of the aris pieces, the *starboard after* one has the first butt one space above the middle; *starboard fore*, three; *larboard aft*, five; and *larboard fore*, seven spaces above the middle station; these ten spaces are set off for the other butts, the same as for the fishes and core. The butts thus placed, give the proper disposition in relation to each other, with a distance apart of about 3 feet 6½ inches, for a 46-gun ship's main-mast; and will give the whole length of the pieces, those at the middle, about 35 feet 6 inches, and the others varying from 16 to 14 feet, except the fore fish, which will always be half of the length of the mast, both heads included.

In applying the fastenings to these masts, the core and fore and after fishes are first brought together. The after fish is laid straight on the skids, and then the core and fore fish are brought on it; when to each abutment is placed one circular coak, 5 inches in diameter, and 3 feet in length. When the abutments are set close, these pieces are treenailed together; one treenail is placed 12 inches on each side of every butt, which passes through the coak, and others at every 2 feet apart, or as near as they will space, fig. 3, A and B. The side fishes are next brought on and coaked at their abutments, as the fore and after fish and core, and fastened with one treenail, which passes through in the middle between the other fastenings, fig. 3, B. The aris pieces are coaked at their abutments with one circular coak 3 inches in diameter and 6 inches long, and are fastened with treenails, which pass through from one aris piece to its opposite, on the opposite quarter of the mast, fig. 3, B, and are spaced at the same distances apart as the other fastenings, with one in the middle between each of those that compose the fastenings of the side and fore and after fishes, fig. 3, A and D. The whole of the treenails in frigates' masts are 1¼ inches in diameter.

Frigates' masts are formed cylindrically throughout; except at once the depth of the trestletrees, above the place of the hounds, at the fore side, on one of the arises of the mast an abutment is sunk in 4½ inches, and the mast taken through straight, fig. 25, *c*, from which it is gradually formed for the mast to be cylindrical at the head.

The body hoops are placed at the stations of the butts, and screwed up, as explained for ships of the line; and one of the mast head hoops is placed 3 inches below the tenon, and one once and a half the depth of the trestletrees above the hounds, and four others are placed at equal distances between.

On the Trestletrees of the new Made-mast. (Figs. 25 and 26, Plate IV.)

The trestletrees, *b*, to these masts are let in half their thickness; the part taken out of the trestletrees is $\frac{1}{8}$ of their thickness for the facing, and the remainder for the score out of the mast. For ships of the line the score is taken out of the side pair, fig. 26, *d*; but for frigates, out of the aris of the mast, fig. 25, *a*, *d*.

To place the Hoops to Made-masts on the common Plan.

The hoops are placed with one above and one below each deck where the mast is wedged: the one above with its middle 21 inches above the partners, and the other 2 feet below, which places two hoops between each deck. Of those below the decks, the lowest one has its lower edge about 16 inches above the heel: between this and the one below the lower deck, they are placed as nearly as possible 3 feet apart. Above the decks one is placed about 3 inches below the tail of the cheek, and the others between this and the one above the upper deck, as near 3 feet apart as they will space. The upper body hoop is placed 12 inches below the upper end of the side-trees, and the intermediate ones between this and the one below the tail of the cheek, are likewise about 3 feet apart.

Upon the Cheeks to Made-masts. (Fig. 1, *a*, Plate IV.)

The cheeks to made-masts are formed in the same way as the cheeks to masts formed of a single tree, except to the larger masts, when they are sometimes formed in two parts at the middle the fore-and-aft way, fig. 1, *x x*: when this is the case, the two parts are united by circular coaks in the head, one under every other hoop, and below the head about 5 feet apart, decreasing in size in the thin part of the cheek, and bolted with bolts about 5 feet apart: where the cheek is hollowed, they are driven diagonally from alternate sides.

To space the Coaks, and bolt the Cheeks.

All the bolts and coaks are disposed as described in single-tree masts checked, except those in the wake of the hounds, where there are six bolts and coaks; the coaks are placed so that each bolt shall pass through one, and are in the alternate edges, upon the opposite sides, the two upper coaks are within 9 inches of the stops, the two lower, about 9 inches from the lower part of the hounds, the other two are in the middle between them; the two upper bolts pass through an iron plate on each side, which plates are used for giving support to the knees. Plate III., fig. 3, *g*.

To space the Hoops upon the Cheeks. (Fig. 8, Plate III.)

The mast-head hoops, *m*, *m*, *m*, are spaced, as explained in single-tree masts cheeked. One clasp hoop is placed 14 inches from the lower end, and 21 inches below the hounds, or over the butts of the fore and after fishes; the others are placed at equal distances between these, according to the size of the mast,—from 28 to 35 inches in diameter, there are 4; from 36 to 41 inches, 5; and 41 inches in diameter and upwards, 6; and they are brought clear of the body hoops.

On Hooping Masts.

Considerable experience and judgment are necessary in determining the size of the hoops, so that they shall bring a sufficient pressure upon the circumference of the masts. The hoops are always driven on the masts as hot as they can be without burning; for in this state, the hoop is the most distended; which, when cooled by water, after it is in its proper position, contracts, and brings the different parts of the mast into a closer combination.

To give the hoops the proper size, the mast-maker girths the masts at their different places by means of pieces of twine, and from the exact girth takes off a proportion, according to his judgment, for the drift of the hoop. If $\frac{1}{64}$ be taken off this girth for drift-hoops, and $\frac{1}{128}$ be taken off for clasp-hoops, the hoops will be found to have the proper circumference in proportion to the masts, so that they will not be likely to break in driving on, and yet will collapse sufficiently to bring the requisite pressure on the different pieces.

Where the mast is cylindrical, the girth only is given to the blacksmiths; but where the hoops circumscribe the cheeks and fishes, moulds are made; at the stations of these hoops as well as the girth from which the proportion is taken off, and the moulds are then carried back to the smaller part of the mast, till the circumference corresponds with the reduced girth, which will determine the stations to make the moulds for them to be of a proper size. Moulds are not always made for every clasp-hoop; commonly one for the upper clasp hoop, one at the tail of the cheek, and one between; and when the fish is hooped, a mould is taken for about every third hoop; but the reduced girth is given for every one. The screw hoops to the new made-mast have the girth reduced.

The methods of forming and making masts, as just explained, are those only which are common to the Royal Dockyards; but they may be considered the most simple and economical of any of the present modes that are in use, for large masts,—those on Sir Robert Seppings's plan, and those made on the plans, figs. 28 and 30, have advantages, for the ease with which they may be transported from one port to another, and repaired in the event of damage: but those on Sir Robert Seppings's plan are not so good for general use.

As the other methods of making masts are confined to the Mercantile Navy, a general description, only, of two of them will be given hereafter.

On forming Masts in the Merchant Navy. (Plate IV.)

The two principal methods of forming and combining masts for merchant ships, are those of Mr. Ferguson, and Mr. Hillman; for which they had letters patent.

Ferguson's patent is for five sectional pieces, or upwards, with the large masts, having an octagonal shaft, with eight exterior pieces brought on the sides. Figs. 21, 22, Plate IV.

The different pieces that form the whole length of the mast are united at their abutments, which are plain, with one or more circular coaks, and two screw bolts; the bolts to masts of 33 inches and upwards, are 1¼ inch in diameter, and 4 feet 6 inches long. To screw them up, and bring the abutments in close contact, nuts with milled edges are used, let into mortices: one nut is first fixed, and the bolt screwed into it; and the other nut, which is screwed up after the abutments are together, is turned round by means of a chisel, placed in the mortice upon the edge of the nut, and driven upon it with a hammer, that acts against the milled edge of the nut.

These masts have several circular coaks, where the different exterior pieces are united to the shaft; but they seldom have any bolts in them, except at the hounds, as the combination is preserved by drift-hoops at the head and heel, and by Atlee's patent screw hoops on the body.

Mr. Hillman's patent is for three sectional pieces and upwards, as figs. 19 and 20, Plate IV. The large masts have an octagonal shaft, with eight exterior pieces, as explained for Ferguson's mast.

These masts have neither bolts nor treenails; but the combination is preserved by dovetail keys and drift-hoops, figs. 23 and 24. The dovetail keys are made of hard wood, and driven lengthways into the mast, at every joint, as fig. 23, Plate IV.; and the different pieces that make up the length of the mast, instead of abutting square, are scarphed, and have likewise a dovetail key. Fig. 24, Plate IV.

The masts with octagonal shafts, and eight exterior pieces brought on the sides, have been a long time in use in the Duch Navy, fig. 18. They have the shaft in general extending the whole length, including the head; and when the sticks are not of a sufficient length to make them in one, they are scarphed with a long scarph, which has five hoops on it. The different pieces are combined together at their joints, by oblong coaks, that let into each piece, about 2 inches, and the whole of the hoops are drift-hoops, as to common masts. *See Traité élémentaire de la mâture des Vaisseaux à l'usage des Elèves de la Marine; par Forfait. Appendice,* p. 309.

Substance of Hoops.

SPECIES OF HOOPS.		Common Mast.				New Made-mast.		Cutter Masts, 160 tons.
		Ships of the Line.	Frigates.	Sloops.	Brigs.	Ships of the Line.	Frigates.	
		ins.	ins.	ins.	ins.	ins.	ins.	ins.
Screw Hoops	Wide	..	..	..	..	5	4½	..
	Thick	..	..	..	..	⅜	⅜	..
Mast-head Hoops	Wide	4¾	4	3¾	3	5	4½	4
	Thick	½	½	½	½	½	½	⅜
Ears	Thick	..	..	..	..	1⅝	1½	..
Screws	Diameter..	..	..	..	..	1⅝	1½	..
Body Hoops............		½	½	½	½	..	..	⅜
	Wide	4½	4	3½	3	..	..	3¾
Clasp Hoops...........	Thick	⅜	5/16	4/16	4/16	..	..	..
	Wide	4	3¾	3¾	3	..	..	..

The dimensions given in the above Table are those which are generally observed; but hoops of the following sizes are sometimes used:

On masts of the diameter of 37 inches and upwards the body-hoops from the heel to the tail of the cheek, ½ an inch thick, and 5 inches wide; from the tail of the cheek to the upper end of the side trees, ⅜ of an inch thick, and 5 inches wide; and all other hoops above the end of the side-tree and below the cheeks, when the spindle is composed of two parts, ¼ of an inch thick, and 4½ inches wide. The hound hoops are ½ an inch by 5 inches; head-hoops ⅜ of an inch by 4½ inches; and clasp-hoops ⅜ of an inch by 5 inches.

For masts of which the diameter is between 37 and 33 inches, the body-hoops from the heel to the tail of the cheeks are ⅜ of an inch thick, and 5 inches wide; from the tail of the cheek to the upper end of the side-tree, ⅜ of an inch thick, and 4½ inches wide; and all the other above the end of the side-trees, and below the cheeks when the spindle is composed of two parts, ¼ of an inch thick, and 4 inches wide. The hound-hoops are ⅜ of an inch by 5 inches; head-hoops ⅜ of an inch by 4½ inches; and clasp-hoops 5/16 of an inch by 4½ inches.

For masts of a diameter between 33 inches and 28 inches, the body-hoops, from the heel to the tail of the cheeks, are ⅜ of an inch thick, and 4½ inches wide; from the tail of the cheeks to the upper end of the side-tree, and all other hoops that come under the cheeks when the spindle is composed of two parts, they are ¼ of an inch thick, and 4 inches wide. The hound-hoops are ⅜ of an inch by 4½ inches; the head-hoops ⅜ of an inch by 4 inches; and the clasp-hoops ¼ of an inch by 4 inches.

For masts of a diameter between 28 and 24 inches, the body-hoops are ⅜ of an inch thick, and 4 inches wide; and all other hoops under the cheeks, ¼ of an inch thick, and 4 inches wide. The hound-hoops are ⅜ of an inch by 4 inches; the head-hoops ¼ of an inch by 3¾ inches; and the clasp-hoops ¼ of an inch by 3¾ inches. But when masts of the above diameter are made of single sticks cheeked, the hoops on the cheeks are not clasp-hoops, but are drifted on from the lower end of the mast; and in that case, these hoops are ⅜ of an inch by 4 inches; and the hound and head hoops are of the same thickness and breadth as those for made-masts of this diameter.

For masts under 24 inches diameter, the hound-hoops are ⅜ of an inch by 4 inches; the drift-hoops on the lower part of the cheeks, ⅜ of an inch by 3½ inches; and the head-hoops, ¼ of an inch by 3½ inches.

Upon Fishing Masts. (Fig. 1, Plate IV.)

When the mast is considered weak, or when it is deemed requisite to give additional strength to single-tree masts, a fish, *g*, is frequently brought on the fore side of the mast, and called the "front fish;" when, to a single-tree mast, cheeked, the butt-end of the tree is worked down, and it extends from the under side of the chock, between the trestletrees, to about 4 feet below the first wedging-deck; but to made-masts, as it would be difficult to get a Riga or red pine to work of sufficient length to scarph with the deck, the fish extends from the chock, between the trestletrees, as far down as it can conveniently be got; in which case the butt-end of the tree is worked upwards, because then the fish can be considered as giving strength to the mast only at the tail of the cheeks. These fishes are in breadth, at the upper end, the same as the spindle athwartship; at the tail of the cheek, and at the deck, when the fish runs through 1 inch more than half the given diameter of the mast; and at the lower end ¾ of an inch less; and in thickness, at the upper end, for sloops, ¾ of an inch less; and for frigates, upwards, 1¼ inch less than the chock between the trestletrees, that a rubbing paunch may be brought on to clear the yards of the clasp-hoops; and, at the same time, that it may not interfere with striking the top-mast, at the tail of the cheek and 2 feet above the deck, when it runs through it, ½ an inch less than half the breadth; and at the lower end 1¼ inch less than half the breadth, that the hoops at the lower end may be easily driven on.

The front fish is coaked to the mast by a chain of coaks, *g*, fig. 1, raised from the round of the mast, commencing as far down as there is sufficient wood to raise them; the midship edge of these coaks is well with the middle line of the mast, excepting the upper and lower ones, which are placed at the middle. The coaks are about 3 feet in length, from 1 inch to 1¼ inch in thickness, and in breadth ¼ the breadth of the fish, with their edges alternately ¼ from the edge of the fish. These fishes are fastened with nails or short rag-pointed bolts, apart on alternate edges, having no more nails or fastenings than are sufficient to hold it till the hoops are on.

Upon Hooping the front Fish.

The hoops, as far down as the cheeks extend, are placed the same as those upon the cheeks, as they answer for hooping both, with a chock placed between the edge of the cheek and fish under each hoop; but the cheeks, instead of having the margin of the fore edge the same as the after edge, as before explained, have their fore edges at the hounds left ½ an inch more than ½ their thickness; and at the lower end, ⅔ their thickness. The hoops below, when the fish scarphs the deck, are placed one about 2 feet above the deck, and one about 5 feet below this hoop; these two hoops are, in general, driven on; and the remaining hoops are clasp-hoops;

between the hoop above the deck, and the one at the tail of the cheek, they are placed so as to be at equal distances of about 5 feet.

A chock is placed under each hoop, so as to make a fair curve with the fore side of the fish and the round of the mast; these chocks are 18 inches in length, and have their upper ends snaped off 5 inches down, to prevent the water lodging on them. In the wake of the deck, instead of having a chock under the hoops, an eking is worked on each side of the fish, of the same form as the chock, to extend from the lower end to about 2 feet 6 inches above the deck, for the convenience of wedging the mast.

When the fish is short of the deck, one hoop is placed about 14 inches from the lower end, and the remaining hoops, between this and the one at the tail of the cheek, are placed at equal distances of about 5 feet; the whole of the hoops are then made to clasp, and are of the same thickness and breadth as are given for the clasp-hoops, in the Tables under made-masts.

Upon the Rubbing Paunch. (Fig. 25, Plate III.)

The rubbing paunch is brought on the main and fore masts of ships, and fore-masts of brigs; it extends from the lower part of the chock, between the trestletrees, to about 3 feet above the uppermost deck, or at a sufficient distance down for lowering the yards to the lowest extent. It is worked with the butt-end upwards; is in breadth $\frac{1}{3}$ the given diameter of the mast, and in thickness about 4 inches at each end; and in the middle, so as to make the fore side straight lengthways, which will not give it of equal thickness all through, on account of the mast having different radii, but is determined at the middle by cutting off several moulds at equal distances, between those at the extremities, to the breadth of the paunch, with their ends square; these moulds are then fayed over the mast, the one at the upper, and the one at the lower end, and the several moulds between, making the upper and lower moulds the thickness intended to be given to the paunch at each end, and making their backs out of winding to an athwartship line. The intermediate moulds are then placed to their proper stations, their middles coinciding with the middle line, and their backs made in the same plane with the end moulds; when this is done, the backs are formed parallel to the hollow, making the vertices of the curves coincide, at the middle line, with the lines just obtained for their backs. These moulds will give the form and thickness of the paunch, at the places where they are made, for its fore side to be in a straight line lengthways.

When the rubbing paunch is trimmed, it is got into its place, the hoops are marked upon it, and the paunch let over them; it is then fastened with nails, upon alternate edges, about 2 feet apart.

Upon the Masts of Cutters and Schooners. (Fig. 43, Plate III.)

These masts generally have their lengths given for the heading and hounding, and are formed the same as single-tree masts without cheeks, except that their heads are in general rounded, and the proportion for the hounds or stops varies from ¾ to 6/7 of the given diameter; and on the fore side, at the hounds, a stop is formed from ¾ to 1 inch, for the support of the lower cap, *b*. It is the case, sometimes, that the heads of these masts are formed ¾ of an inch larger the fore-and-aft way than the athwartship, to give additional strength in acting against the gaff, for which wood is left, instead of bringing on copper, similar to section *a*, *b*, fig. 40.

To Hoop the Mast.

The lower hoop, *g*, on the mast head, is placed to receive the eye-bolt for the throat hallyards, *g*, which is from 2 feet to 2 feet 8 inches above the lower side of the lower cap. This hoop is in general formed with a wide collar, to receive the shoulder, which is formed in the bolt for giving support in resisting the strain downwards. This outrigger for the eye in first class steam-vessels, and large class cntters, is 2¼ inches wide, and 3 inches deep; the next class, 2 inches by 2¾ inches; the third class, 1¾ inches by 2½ inches, and the fourth class, 1½ inch by 2¼ inches. The upper hoop is placed with its upper edge about 6 inches below the upper cap, and three others are placed at equal distances between this and the lower one. The four upper hoops, *r r r*, have an eye-bolt to pass through them from the after side of the mast, and clenched on the fore side, for the peak hallyards. These eye-bolts, for first class cutters and steamers, are 1½ inch in diameter; second class, 1⅜ inch; third class, 1¼ inch, and fourth class, 1⅛ inch in diameter; their eyes lie horizontally; those in the upper and lower hoops are placed in the middle line of the mast, and those through the two intermediate ones, 1½ inch on each side the middle. One hoop is driven on the heel, about 6 inches above the shoulder of the tenon: *a*, is the iron cap; *f*, shive in mast head for top rope; *b*, the lower cap; *e*, hounds piece.

Upon Bowsprits. (Plate IV.)

Bowsprits are single-tree, figs. 5 and 6, or made, fig. 4: the part that rests upon the stem and apron, from the fore part of the stem to the after part of the apron, is called the "bed;" the part from the outer end of the bed to the heel is called the "scarph" or housing, and ⅑ the given length in from the outer end is called the "bee's seating" or head.

Upon Single-tree Bowsprits. (Fig. 39, Plate III.)

Single-tree bowsprits have the top end of the tree worked outwards. The given length of the bowsprit is from the fore part of the tenon of the cap, to the after part of the tenon at the heel; the distance from the heel to the length of the scarph or housing is set off for the outer part of the bed, and within this distance the length of the bed, where the bowsprit is parallel, and in diameter equal to the given diameter; from the outer part of the bed to the outer end, the bowsprit is divided into four equal parts for the outer quarters, and from the inner part of the bed to the inner end, into four parts for the inner quarters. The outer end is ⅔, and inner end ⅚ of the given diameter, and graduated between each end and the bed, according to the common method.

Bowsprits are made round their whole length, excepting on the upper part at the outer end, where they are left square ⅑ the given length, to receive the bee-block. The round on the lower part at the outer end is carried up to the upper angle of the lower eight-square, and the square is brought into the round, by a hance, *g*, about ¼ the length of the head for the stops; instead of having cleats nailed on for the collars of the stays and bob-stays, which materially injure the bowsprit, wood is now left on the bowsprit to form stops, Plate III., fig. 39, *a*, *a*, *a*, and section L. The stops project in small bowsprits 1½ inch, and in the largest sized single-tree bowsprits 2½ inches, or as much as the stick will allow. These stops are placed, if three, the middle one at ⅓ of the distances from the head to the bed of the bowsprit, and the outer one ⅓ the girth of the bowsprit without it, and inner stop ⅓ the girth within it. If only two bob-stays, the third of the distances from the head to the bed is set in as before, and ⅙ the girth of the bowsprit is set off without and within the ⅓ for the two stops.

To Hoop a Single-tree Bowsprit.

Single-tree bowsprits have, in general, one hoop on the heel driven on, 2 feet 4 inches, and two on the head, one 4 inches within the hance, and one 4 inches within the aft side of the cap, at the lower side. Should the heel be shaky, or the body of the bowsprit knotty, additional hoops may be added; to the heel, one or two, as may be necessary, and upon the body, one over each bad knot.

Upon a Made-bowsprit. (Fig. 4, Plate IV.)

Made-bowsprits have the same length of head; are formed at the bed, and are of the same proportions, at the head and heel, as bowsprits formed of a single tree; they are composed of four principal pieces, two called the upper and lower trees, *a a,* or main pieces, and the two side fishes, *b b.* The upper and lower trees are united at the middle, and when together, make the diameter of the bowsprit up and down; athwartships these pieces are at the outer end the diameter of the jib-boom, and at the bed half the given diameter of the bowsprit; and from this place to the inner end they are parallel. The side fishes are the difference of thickness between the upper and lower trees, and the whole diameter of the bowsprit: they therefore make up the athwartship diameter.

The faying surfaces, and outer parts of the upper and lower trees, are lined on both edges, and trimmed through straight and out of winding; the two main pieces are then brought together and dowelled.

When the two main pieces are bolted together, they are placed with one of the outer sides upwards, and lined to their athwartship dimensions, working from a middle line, which is got previously upon the side that is upwards: when the lines are traced out, the middle line is plumbed over upon each end.

For obtaining its upper side, the bowsprit is turned over, lined as before, and the two pieces trimmed through, straight together.

The side fishes are next brought upon the main pieces; they are lined and trimmed as before described. The aris pieces are wrought and fastened, and the bowsprit squared and rounded, as in made-masts, excepting that the fishes, if possible, should work through in the wake of the bees, at the lower side; but the upper part, from the first hoop, should be left 4 inches down until the hoops are on, to allow the hoops to pass over the hance; when the hoops are on a piece is fitted in, and the head hoops driven over it.

The upper and lower trees are coaked together at the middle, and have the butt-end of the tree worked inwards. When they are together, the side fishes are coaked to them, with their butt-ends likewise inwards.

To Coak and Fasten the several pieces of a Bowsprit.

The upper and lower trees have one coak under each hoop, on each side of the middle line, and one through bolt in every coak; and the side fishes are coaked between each hoop, in each main piece alternately, and have one bolt through each coak, driven through both fishes and the main piece.

To Hoop a Made-bowsprit.

Made-bowsprits have two hoops upon the head, one about 2 feet 4 inches in, or so as to be 3 inches clear of the after side of the cap, at the lower side of the bowsprit. The other at such a distance that there shall be half the length of head between them. The next hoop in is placed with its centre 3 feet from the centre of the inner head hoop. One hoop is placed about 3 inches without, and one 3 inches within the bed, and one 2 feet 4 inches from the heel. The intermediate hoops are placed both upon the inner and outer parts of the bowsprit, as near as they will space to 3 feet from centre to centre.

Upon the Bowsprit of Cutters.

Cutters' bowsprits are formed for the given diameter to be ⅓ from the inner end, within which they are made parallel; and the outer end is made ⅔ of the given diameter; from the inner end, as far as the bowsprit reefs, it is made square, with a champher taken off the angles from 1½ inch to 2½ inches; and from the termination of the square part to the outer end, it is made round.

The square is formed into the round by a hance, in length about ¾ the diameter of the bowsprit.

Upon the outer end of these bowsprits a hoop is let on, with four eye-bolts in it, one upon the top, one at the bottom, and one on each side; 6 inches within this hoop a shive-hole is cut up and down, from 1¾ inch to 2½ inches, for the jib out-haul; and at the inner end a shive-hole is cut, lying horizontally, for bowsing the bowsprit out: this shive-hole is mouthed quite to the end, for unshipping the rope.

The reef holes are in general from three to four in number, and are at a distance from each other, from the inner part to the inner part, from 2 feet 4 inches to 2 feet 6 inches, otherwise they are made to conform to the different sizes of the jibs. The holes are made for a square fid, or round, to receive a bolt; when square, they are ⅓ the diameter of the bowsprit, in the direction of its length, and ⅔ this size up and down; when round, they are of iron.

No. and Size of Coaks and Bolts placed in Lower Masts.

	120				104				84				74			
	Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.	
MAIN-MAST.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.
Length	—	—	123	9	—	—	119	8			115	6	—	—	108	—
Diameter		41	—	—	—	39⅞	—	—		38½			—	36	—	—
Spindle bolts	12	¾	1	10	12	¾	1	10	12	¾	1	9½	10	¾	1	8
Ditto ditto	6	⅞	2	3	6	⅞	2	2½	6	⅞	2	2	6	⅞	2	1
Ditto coaks, near the hound		6		3		6		3		6		3		5		3
Ditto ditto, upper & lower end		5 to 4		3		5 to 4		3		5 to 4		3 3		4½ to 3½		3 3
From the hounds to the tail of the cheek bolts	17	1	3	9	17	1	3	8	17	1	3	7½	16	1	3	5
Head bolts	7	1	2	4	7	1	2	4	7	1	2	3½	7	1	2	2
Body bolts	19	⅞	3	1	19	⅞	3	0	19	⅞	3	0	17	⅞	2	9½
Bolts	108	⅞	1	4½	104	⅞	1	4¼	104	⅞	1	4	98	⅞	1	3
Knee bolts	6	1¼	3	11	6	1¼	3	9	6	1¼	3	11	6	1¼	2	9½
Coaks in side trees		5 to 4½				5 to 4½				5 to 4½				5 to 4½		
Coaks in fishes		5				5				5				5		
Ditto fishes, upper end		4½				4½				4½				4½		
Ditto cheeks, at the hounds		6				6				6				6		
Ditto cheeks		5				5				5				5		
FORE-MAST.																
Length	—	—	114	10	—	—	110	4	—	—	105	0	—	—	98	6
Diameter	—	38	—	—	—	36¾	—	—	—	34⅜	—	—	—	31¼	—	—
Spindle bolts	11	¾	1	8½	11	¾	1	6½	11	¾	1	6	10	¾	1	5¼
Ditto ditto	6	⅞	2	1	6	⅞	2	0½	6	⅞	2	0	6	¾	1	9½
Ditto coaks near the hounds		5				5				5					4½	
Ditto ditto, upper & lower end		4½ to 4				4½ to 4				4½ to 4					4 to 3½	
From the hounds to the tail of cheek bolts	16	1	3	6	16	1	3	3½	16	1	3	3	15	1	3	0
Head bolts	7	1⅛	2	3	6	1¼	2	1½	7	1⅛	2	1	6	1	1	10½
Body bolts	17⅛	⅞	2	10½	17	⅞	2	9	17	⅞	2	9	15	¾	2	5
Bolts	102	⅞	1	3½	94	⅞	1	3	98	⅞	1	3	84	¾	1	1
Knee bolts	6	1¼	3	7	6	1¼	3	4	6	1¼	3	7	6	1⅛	3	1
Coaks in side-trees		4½ to 4				4½ to 4				4½ to 4				4½ to 4		
Ditto fishes		4½				4½				4½				4½		
Ditto fishes, at the upper end		4				4				4				4		
Ditto cheeks, at the hounds		5				5				5				5		
Ditto ditto, head and lower end		4				4				4				4		
MIZEN-MAST.																
Length	—	—	83	8	—	—	81	9	—	—	79	0	—	—	73	11
Diameter	—	25	—	—	—	24⅛	—	—	—	23⅛	—	—	—	21⅛	—	—
Body bolts	13	¾	1	10½	13	¾	1	10½	12	¾	1	10	10	¾	1	9½
Hound bolts	5	⅞	2	6	5	⅞	2	6	5	⅞	2	4½	5	⅞	2	3½
Head bolts	5	⅞	1	6	5	⅞	1	6	5	⅞	1	5½	4	⅞	1	4
Rag-pointed bolts	76	¾		10½	76	¾		10½	72	¾		10½	70	¾		10½
Kneebolts	5	1	2	5	5	1	2	5	6	1	2	4	6	1	2	2½
Coaks in cheeks at the hounds	—	4½	—	3	—	4½	—	3	—	4½	—	3	—	4	—	3
Ditto ditto, head	—	4	—	3	—	4	—	3	—	4	—	3	—	3½	—	3
Ditto ditto, lower end	—	4	—	3	—	4	—	3	—	4	—	3	—	3½	—	3
BOWSPRIT.																
Length	—	—	75	1			72	6	—	—	71	11	—	—	66	
Diameter	—	37	—	—		36			—	36	—	—		34⅛	—	—
Body bolts	23	⅞	2	9	22	⅞	2	8½	22	⅞	2	8	21	⅞	2	7
Coaks in body	35	5		3	33	5		3	33	5		3	32	5		3
Ditto fish	34	4½		3	33	4½		3	33	4½		3	31	4½		3
Bolts	46	⅞	1	4½	44	⅞	1	4½	44	⅞	1	4	42	⅞	1	3½
Block bolts	3	1⅛	3	2½	3	1⅛	3	1½	3	1⅛	3	1	3	1	2	11⅛
Bee bolts	6	⅞	3	1	6	⅞	3	0	6	⅞	3	0	6	⅞	2	10
Cap eye bolts	1	1¼	3	7	1	1¼	3	6	1	1¼	3	6	1	1¼	3	4
Pins to shive	2	1⅛	1	2	2	1⅛	1	2	2	1⅛	1	2	2	1⅛	1	2
Shive, thick	—	3	—	3	—	—	—	3	—	—	—	3	—	—	—	3
Shive, diameter	—	11	—	—	—	10	—	—	—	10	—	—	—	10	—	—

No. and Size of Coaks and Bolts placed in Lower Masts.

	60				50				46				42			
	Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.	
	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.
MAIN-MAST.																
Length	—	—	101	0	—	—	96	0	—	—	90	0	—	—	88	11
Diameter	—	32¼	—	—	—	30¼	—	—	—	28	—	—	—	27⅜	—	—
Spindle bolts	10	¾	1	6¼	—	—	—	—	—	—	—	—	—	—	—	—
Ditto	5	¾	1	10	—	—	—	—	—	—	—	—	—	—	—	—
From hounds to the tail of the cheek	15	⅞	3	1⅛	15	⅞	2	11	14	⅞	2	9⅛	14	⅞	2	9
Head bolts	6	⅞	2	0	6	⅞	1	10	6	⅞	1	9	6	⅞	1	8½
Body bolts	16	¾	2	6	15	¾	2	4½	15	¾	2	3	14	¾	2	2
Bolts	90	¾	1	2	84	¾	1	0	82	¾	1	0	80	¾	1	0
Knee bolts	6	1⅛	3	1¼	6	1⅛	2	11	6	1⅛	2	9	6	1	2	8¼
		4½		3		4		3		4		3		4		3
Coaks in side-trees		to				to				to				to		
		4		3		3½		3		3½		3		3½		3
Ditto fishes		4½		3		4		3		4		3		4		3
Ditto fishes upper end		4		3		3½		3		3½		3		3½		3
Ditto cheeks at the hounds		5		3		4½		3		4½		3		4½		3
Ditto do. upper & lower end		4		3		4		3		4		3		4		3
FORE-MAST.																
Length	—	—	92	0	—	—	88	1	—	—	82	3	—	—	81	3
Diameter	—	28¾	—	—	—	27½	—	—	—	25¼	—	—	—	24½	—	—
Body bolts	15	¾	2	3½	14	¾	2	2	14	¾	2	0	14	¾	2	0
Hound bolts									5	1	2	6	5	1	2	6
And the tail of the cheek	14	⅞	1	10	14	⅞	2	8¼		—	—	—	—	—	—	—
Head bolts	6	⅞	1	9½	6	⅞	1	8¼	5	⅞	1	6½	5	⅞	1	6½
Bolts	84	¾	1	0½	80	¾		11½	80	¾		11	80	¾		11
Knee bolts	6	1⅛	2	10½	6	1	2	9	6	1	2	6	6	1	2	6
		4		3		3½		3		3½		3		3½		3
Coaks in side-trees		to				to				to				to		
		3½		3		3		3		3		3		3		3
Ditto fishes		4		3		3½		3		3½		3		3½		3
Ditto fishes upper end		3½		3		3		3		3		3		3		3
Ditto cheeks at the hounds		4½		3		4		3		4		3		4		3
Ditto do. upper & lower end		4		3		3½		3		3½		3		3½		3
MIZEN-MAST.																
Length	—	—	72	—	—	—	69	2	—	—	64	6	—	—	64	6
Diameter	—	26¾	—	—	—	20	—	—	—	18⅜	—	—	—	18⅜	—	—
Hound bolts	5	⅞	2	1½	5	⅞	2	1	5	⅞	2	0½	5	⅞	2	0½
Ditto	2	¾	2	5½	2	¾	2	5	2	¾	2	4½	2	¾	2	4½
Knee bolts																
Coaks at the hounds																
BOWSPRIT.																
Length	—	—	60	4	—	—	58	7	—	—	55	10	—	—	55	2
Diameter	—	31¼	—	—	—	28½	—	—	—	27¾	—	—	—	26⅝	—	—
Block bolts	3	1¼	2	8⅛	3	1⅛	2	6	3	1⅛	2	4	3	1⅛	2	3½
Bee bolts	6	⅞	2	7½	6	¾	2	4½	6	¾	2	2½	6	¾	2	2
Cap eye bolts	1	1¼	3	1	1	1⅛	2	9½	1	1	2	6½	1	1	2	6
Pins to shive	2	1⅛	1	1⅛	2	1⅛	1	1	2	1¼	1	1	2	1⅛	1	1
Shive, thick	—	—	—	2½	—	—	—	2½	—	—	—	2⅜	—	—	—	2¼
Shive, diameter	—	8	—	—	—	8	—	—	—	8	—	—	—	8	—	—

*No. and Size of Coaks and Bolts placed in Lower Masts.**

	Large Sloop.				Small Sloop.				18-gun Brig.				10-gun Brig.			
	Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.		Number.	Diameter.	Length.	
	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.	No.	ins.	ft.	ins.
MAIN-MAST.																
Length	—	20½	71	—	—	—	67	—	—	—	67	3	—	—	54	6
Diameter	—	20½	—	—	—	19½	—	—	—	22½	—	—	—	17¾	—	—
Hound bolts	6	⅞	2	2⅛	6	⅞	1	11½	5	⅞	2	1	5	¾	1	8½
Head bolts	4	⅞	1	4	4	⅞	1	2¼	2	¾	2	6	2	⅝	2	2
Bolts in tail of cheek	20	⅝	1	1½	18	⅝	1	0	—	—	—	—	—	—	—	—
Bolts in head of the cheek and in front fish	36	⅝		11	34	⅝		10½	—	—	—	—	—	—	—	—
Knee bolts	6	⅞	2	1¾	6	⅞	1	10½	—	—	—	—	—	—	—	—
Coaks in cheeks at the hounds	—	3½	—	3	—	3½	—	3	—	—	—	—	—	—	—	—
Ditto cheeks at the head	—	3	—	3	—	3	—	3	—	—	—	—	—	—	—	—
FORE-MAST.																
Length	—	—	64	6	—	—	61	6	—	—	59	9	—	—	46	6
Diameter	—	19	—	—	—	18	—	—	—	20	—	—	—	16	—	—
Hound bolts	6	⅞	2	0½	6	⅞	1	9¾	6	⅞	1	10½	5	¾	1	6
Head bolts	4	⅞	1	3	4	¾	1	2	4	¾	1	3	2	⅝	1	10½
Bolts at the tail of cheeks	18	⅝	1	0½	16	⅝		11	16	⅝	1	0	—	—	—	—
Bolts at the head of cheeks and front fish	33	⅝		10	32	⅝		10	32	⅝		10	16	⅝	—	10
Knee bolts	6	⅞	2	0¾	6	⅞	1	9	6	⅞	1	11¾	—	—	—	—
Coaks in cheeks at the hounds	—	3½	—	3	—	3½	—	3	—	3½	—	3	—	—	—	—
Ditto cheeks at the head	—	3	—	3	—	3	—	3	—	3	—	3	—	—	—	—
MIZEN-MAST.																
Length	—	—	54	0	—	—	55	11	—	—	—	—	—	—	—	—
Diameter	—	16¼	—	—	—	20	—	—	—	—	—	—	—	—	—	—
Hound bolts	5 2	¾ ⅝	1 1	7⅝ 11	5 2	¾ ¾	1 1	5¼ 9	— —	— —	— —	— —	— —	— —	— —	— —
BOWSPRIT.																
Length	—	—	44	0	—	—	37	6	—	—	43	4	—	—	36	—
Diameter	—	21⅛	—	—	—	18¾	—	—	—	20	—	—	—	17	—	—
Block bolts	3	⅞	1	11	3	⅞	1	10	3	⅞	1	9½	3	⅞	1	6½
Bee bolts	6	¾	1	9	6	¾	1	8½	6	¾	1	8	4	¾	1	5
Eye bolt to cap	1	⅞	2	0½	1	⅞	2	0	1	⅞	1	11¼	1	⅞	1	7¾
Pins to shive	2	1⅛		10	2	1		10	2	1		10	2	⅞	—	10
Shive, thick	—	—	—	2	—	—	—	2	—	—	—	2	—	—	—	1¾
Shive, diameter	—	5	—	—	—	5	—	—	—	5	—	—	—	4½	—	—

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* For the bolts, coaks, &c. in the masts of merchant-vessels, the same sizes to be given, that fall under the same lengths and diameters of masts.

On the Top-masts. (Figs. 12 and 13, Plate III.)

Top-masts have their lengths given the same as the standing masts ; and have the lengths of the head, and additional length of head, formed from the given length, when given in these terms ; but the lengths are now more commonly given in hounding and heading. From the lower end, half the breadth of the hoop on the heel, or sometimes 6 inches, for the place of the lower side of the trestle-trees is set up, and from this distance the given length, and beyond it $\frac{1}{36}$ for an additional length of head; then the whole length of the head, or the distance to the stops, is made $\frac{5}{36}$ the given length of the mast, and from the lower end the length of the lower mast head for the place of the cap, or place of the given diameter.

From the cap to the stops, the mast is quartered and graduated ; and below the cap it is made parallel to the given diameter, graduating to $\frac{3}{4}$ at the stops for the body ; but to give additional strength, it is now more commonly made $\frac{4}{5}$ the given diameter, or as large as it can be made to pass through the cap, forming it with the body of the top-mast at the lower part of the hounds, the length of which is $\frac{1}{8}$ of the given length, or $\frac{1}{2}$ the given head. At the head, the top-mast is $\frac{5}{9}$ or $\frac{2}{3}$ the given diameter.

The fore and after stops are formed to $\frac{1}{6}$ the size at that place, or as large as the top-mast will go through the lower cap, fig. 12, *c*, and on each side hounds pieces are in general brought on, *b* ; and for raising two coaks, *a*, $1\frac{1}{8}$ inch of wood is left from the stops to $\frac{1}{2}$ the length of the hounds down, and from thence it is brought into the size of the top-mast at the lower part of the hounds ; but when the stops are worked out of the mast, they are left for their outer parts to be the size of the top-mast at the second quarter, or as large as possible, to allow them to go through the cap.

The top-mast is rounded from the lower part of the hounds to $2\frac{1}{2}$ diameters above the upper part of the hoop, *l*, where it is left square for the heeling, *p*, *p*, excepting that a champher is taken off from each angle to $\frac{1}{8}$ the diameter ; the hounds have likewise a champher taken off at the stops from each angle to $\frac{1}{8}$ the size of the stops, which is brought to the size of the eight square at the lower part of the hounds. The head is square above the stops, with about $\frac{3}{4}$ of an inch champher taken off the angles.

On a Lengthened Top-mast.

Made or lengthened top-masts are sometimes used for ships of the line, in order to bring into use such sticks or trees as could not otherwise be made to answer for these classes of ships ; as by forming them at the heel by several pieces, and shortening the main piece, the crooked or knotty tops may be cut off. These top-masts have a lengthening piece brought on their heel 8 inches square, and from 9 to 10 feet in length, as the stick may require; this piece tenons into the heel, and has the diagonals lying athwartships, and fore-and-aft, or its four sides parallel to the eight squares on the quarters; the lower end of the top-mast is formed to the size of this piece, preserving the cylindrical form of the top-mast, 3 feet below the cap, or ⅓ the length of the scarph.

To form the lower part of the top-mast, four pieces are brought on, with their joints lying fore-and-aft, and athwartships, extending within about 2 inches of the lower side of the cap to the heel, faying upon the lengthening piece, and upon the lower end of the top-mast; these pieces are, to top-masts of 18 inches in diameter, 12 inches square, and to top-masts of 21 inches in diameter, 13 inches square; they are made at the upper end with a lip of 1¼ inch in thickness, and at the lower end to the full size, to give a good drift for the hoops.

These top-masts have a hoop at the lower end, and from this distance the length is set off as for the common top-masts, and above the cap it is formed the same; but, below, the pieces brought on are rounded from 2½ diameters, above the upper part of the hoop, or place where the length is set off; below it is square, except a champher is taken off to ⅙. The fid hole, and whole shive, are placed the same as in the common top-mast.

To space the Hoops, Coaks, and Bolts.

There is one hoop placed upon the heel, *l*, as to all top-masts, called the "heel hoop;" one is placed 6 inches from the upper end of the four pieces, and one 6 inches above the butt of the lengthening piece; there is likewise one placed at the lower part of the round, and one a foot below the butt of the lengthening piece. In two of the pieces that are opposite, there is one circular coak placed under each, into the lengthening pieces, or top-mast, according as the hoop comes over: in the other two, they are placed about 6 inches above the hoop; below the hoops in two of the pieces that are opposite, and have not the coak under the lower hoop, one coak is placed in each, in the middle between the fid hole and the lower hoop; one is likewise placed in each of the two opposite pieces, just above the half shive, and in the other two in the middle, between this, and the fid hole. To the third hoop down a rag-pointed bolt is driven through each circular coak, below which, a through bolt is driven through each circular coak, and its opposite.

PLATE IV.

The lengthened top-masts now in general use, fig. 46, have their lower ends formed to a tongue, *a*, at the upper part of the shive hole (*d*, fig. 12), to form a scarph to the lengthening pieces, which are formed in two parts, meeting at the centre of the shive, from the lower part of the shive down, the surface of the joint being in the same direction as the shive hole is cut, section *e;* in this surface, coaks, and on each part that is connected with scarph or tongue, coaks are placed, in the scarph and lower part; on the lower part, below the shive, three hoops are placed, one on the heel, as to the common top-masts, and one just below the shive, and one between; on the scarph or upper part, four hoops are placed, one about 3 inches from the upper lip, and one just above the upper part of the shive, and, between these, two others at equal distances apart. In the parts of the lengthening pieces that hollow out, Mr. Blake, master shipwright of Portsmouth Yard, has introduced a coak, *e*, which adds very materially to the strength of the scarph, by preventing the upper lip from working, and would appear, after several trials, to have made the lengthened top-mast quite efficient.

On Top-gallant Masts. (Fig. 45, Plate III.)

Top-gallant masts are, in general, made with the top-gallant and royal in one, *a*, *b*. They are sometimes, however, fitted with stump poles, when they frequently have a sliding gunter-mast fitted to them; and in other cases they are fitted with fidded royal-masts. When the royal and top-gallant are in one, the given length is set off from the lower end; and from that length is set back $\frac{7}{72}$ for the stops; then, from the whole length, half the given length is set beyond it, for the royal stops. This proportion for the length of the royal pole is frequently departed from, and the whole length is made to vary from $\frac{9}{13}$ to $\frac{4}{5}$ of the given length; and they are sometimes extended to $\frac{1}{3}$ and 10 feet; but this gives the pole considerably too great a length for small vesesls: beyond the royal stops, $\frac{7}{33}$ of the given length is set off for the sky-sail or signal pole; the length of the hounding, or from the heel to the stops, as well as the length of the poles is given, and a very short pole above the royal stops, *c*, is allowed.

From the lower end, the station of the cap is set off for the place of the given diameter; and from this distance to the top-gallant stops, *e*, where it is $\frac{10}{13}$, and from the top-gallant stops to the extremity of the signal or sky-sail pole, where it is half the given diameter (or, if no sky-sail pole, $\frac{3}{5}$ at the royal pole), the mast is quartered and graduated, without regarding the stops.

The top-gallant stops are in length twice, and the royal stops once and a half the given diameter, and project so as to be the size of the second quarter of their respective masts or poles. The stops are eight-squared; and the top-gallant mast is rounded from two diameters below the upper part of the cap, to the lower part of the stops; the royal is rounded from one diameter above the top-gallant stops, where it is left square, in case of jacks being fitted for supporting the royal, excepting that a champher is taken off to bring it in to the eight-square of the stops, to the lower part of the royal stops; the signal or sky-sail pole is rounded from the stops to the extremity. The heel of the top-gallant mast is eight-squared, from two diameters below the upper part of the cap, to three diameters above the lower end, and from thence downwards it is left square, *n, n;* except that a champher of $\frac{1}{8}$ is taken on each way to $2\frac{1}{2}$ diameters up, from which place it is formed into the eight-square. The top-gallant masts are now rounded quite through, leaving only the lower part, *n, n,* square, and the stops round parallel to the pole, on which is fitted a copper funnel, *a,* figs. 27 and 28, to slide up and down with the top-gallant mast, which when struck, rests on the top-mast cap, fig. 28.

On Stump-pole Top-gallant Masts.

Stump-pole top-gallant masts have their length set off, and are formed the same as the top-gallant mast and royal in one, excepting that $\frac{7}{36}$ only, or two heads, is set beyond the given length, and $\frac{7}{72}$, or one head, back for the stops, which makes the pole three heads above the stops.

The diameter of the extreme end of the pole, is half the given diameter.

With Fidded Royal-masts.

Top-gallant masts for fidded royal-masts are the same as top-gallant masts with the royal in one, excepting that the head and additional length of head are set off the same as for top-masts, and with the same proportions for the diameters.

On Yards.

The place of the given diameter of yards is at the slings; the yard-arm always bears a certain proportion to the slings, according to the nature of the yard; and the yard is quartered from the slings to the yard-arm; and these quarters are distinguished as, 1st, 2nd, 3rd quarters, and yard-arm. The proportions for the quarters are obtained by graduating them, as before explained.

Upon the Lower-yards.

Lower-yards are made of a single tree, or of two pieces scarphed together, with a vertical scarph; fig. 42, Plate III. The yard-arms, in both cases, are from $\frac{5}{12}$ to $\frac{1}{2}$ the diameter of the slings; when in a single piece, the yard is left in the eight squares, at the middle; the after one to half the length of the yard, or to 18 inches beyond the quarter iron, and the others, which are for the sling cleats and battens, $\frac{1}{6}$ the length of the yard. When the yard is formed of two pieces, there are no squares left, but the yard is formed to the round, and the battens are hollowed.

The scarph to the yard made of two pieces, is about $\frac{1}{3}$ the given length, with from 3 feet 6 inches to 4 feet added, with the butt ends of the trees placed together. The lips of the scarphs are made about $1\frac{1}{2}$ inch in thickness, and the scarph is formed straight, with the surface vertical, or up and down; except at the ends of each scarph, where the lips are hollowed so as to correspond to the round of the yard, forming into a straight surface about $\frac{1}{6}$ from each end, in order that the breadth of the lips may not be too narrow. The scarph has one circular coak under each hoop, as far as the surface is straight.

To bolt the Scarph.

The scarph is bolted with one through bolt in each circular coak in the thick part of the scarph, of $\frac{7}{8}$ of an inch in diameter, and in the thin part $\frac{5}{8}$ of an inch in diameter.

To hoop the Lower-yards, formed of a Single Tree.

The number and place of the hoops on the yard-arms are governed principally by the knots or shakes; one at the middle for the iron slings, and the next about $\frac{1}{7}$ the length of the yard out, or so as to cover the worst knot near this distance; the outer hoop, so as to cover the worst knots, from 2 to 3 feet within the inner hoop, on the yard-arm irons. The quarter iron, *d*, which is placed $\frac{3}{16}$ the length of the yard from the outer end, is made to answer, if possible, for a hoop; then between the quarter iron and inner hoop, and quarter iron and outer hoop, one or two others are placed, so as to cover the worst knots. The yard-arm that is formed from the top end of the tree, determines the number of hoops, and on the other arm the same number is in general placed, but spaced so as best to close the shakes. On the scarph of the main-yard, one hoop is placed about 9 inches from each lip; between these, the others are placed, as near as they will space to 2 feet 6 inches apart, from centre to centre.

It is seldom the case now, that hoops are placed on the middle of the yard for the slings. The slings are chain, and pass round the yard. To sling the yard, a chain is placed with the bight passing over a cleat firmly secured on the after side of the mast, and over a cleat on each quarter, the cleat on the after side is at $\frac{2}{3}$ the length of the mast head up; the two ends of the chain being of a length sufficient to extend down one link below the lower side of the trestle-trees, having a slip attached to each lower link. The chain sling round the yard has a large link at the middle for its two ends to pass through. These ends are brought up, and the slips on the ends of the chain round the mast are made to pass through the links on each end of the chain round the yard. The manner of slinging the yards, here explained, is that which is commonly used in ships of war; this plan, however, is frequently deviated from, as sometimes the bight of the slings attached to the mast is brought over the cap, and at other times it is only carried $\frac{1}{4}$ the mast head up.

Where there is a difficulty in obtaining sticks sufficiently large to make the lower-yard in two pieces, it may be made as fig. 34, of two trees, as *a*, *a*, and two fishes, *b*, *b*; the scarphs of the two trees and the two fishes being in length half the length of the yard. This mode of making a lower-yard, very much reduces the size of the trees required, as may be seen by comparing the two trees, A and B, on which are shown the yard when converted. A, the yard with two trees and two fishes; and B, the common yard with two trees only. Although there is some increase of expense in the workmanship in making a yard on this plan, yet, as a whole, it is of considerably less expense than the common yard, from the reduction in the size of the trees required.

Upon the Top-sail Yard. (Fig. 41, Plate III.)

Top-sail yards have their ends or yard-arms from $\frac{3}{7}$ to $\frac{1}{2}$ the diameter at the slings, or given diameter; and the eight squares left to $\frac{1}{8}$ the given length on each side of the middle. These masts have one shive placed vertically in each end, with the outer part at 4 inches more than the breadth of the top-sail at the lowest reef cringle, and the end of the yard should be 12 inches beyond it.

All top-sail yards above 12 inches in diameter, commonly require lengthening, if sticks are used of the most suitable diameter to convert them from, since the specification for their lengths is commonly too short for the whole length of the yard. When lengthened, a tongue is formed from the yard put within the cleating, leaving the lip about $1\frac{1}{2}$ inch, and the length about 10 feet; to which the lengthening piece is made to correspond, and is afterwards hooped with seven hoops. When the length to the cleating of one yard-arm is too great to make up the deficiency by which the stick is too short, it would be be better to shorten the stick, and lengthen both yard-arms to the cleating, than to carry the tongue of one yard-arm much within the cleating, where the greatest stress falls; however, it would be much better if the specifications for the timber, of which yards are converted, were altered, to prevent the necessity of lengthening them. These yards are left in the eight squares to $\frac{1}{3}$ the whole length of the yard, and on these squares battens, *g*, *g*, *g*, are placed, and hooped, *s*, *s*, *s*, between the battens, *g*, *g*, *g*, ekings or cheeks, *r*, *r*, *r*, are placed under each hoop.

On Made Top-sail Yards. (Fig. 35, Plate III.)

To make the top-sail yards of large ships, as shown in Fig. 35, by having two trees, *a*, *a*, and two fishes, *b*, *b*, the yard would be stronger and of considerably less expense. The common top-sail yards, as lengthened at one or both ends, are not so uniformly strong as when made with two trees and two fishes, while the expense is considerably reduced by using small trees, as C and D; C, being the stick required for the yard, as fig. 35.

On the Cross-jack Yard.

The cross-jack yard has the yard-arms $\frac{3}{7}$ of the diameter at the slings, and the eight-square left on the after side to $\frac{1}{2}$ the length of the yard; the upper, lower, and fore sides of the yard, are left in the sixteen squares $\frac{1}{4}$ the length of the yard; these yards have a ferrule at each end.

Upon the Sprit-sail Yard.

The sprit-sail yard has the arms $\frac{3}{7}$ the diameter at the slings, and is left in the sixteen squares at the middle, to $\frac{1}{4}$ the length of the yard, and has a ferrule and eye at each end.

On the Top-gallant Yard.

The top-gallant yards are at the ends $\frac{3}{7}$ of the diameter at the slings, and are left in the eight squares at the middle, $\frac{1}{4}$ of their length; these yards have a ferrule and eye at each end.

On the Royal Yards.

The royal yards are at the ends $\frac{5}{12}$ of the diameter at the slings, and are left, in the sixteen squares at the middle, $\frac{1}{4}$ the lengh of the yard.

On the Studding-sail Yards.

The studding-sail yards are in the same proportion of the yard-arms as the top-gallant yard, but are rounded quite through.

On the Booms, &c.—Main and Driver Booms. (Figs. 36 and 37, Plate III.)

These booms have the given diameter $\frac{1}{3}$ from the after end, which is the butt-end of the tree, or at the sheet or taffrail; their outer ends are $\frac{3}{4}$, and the fore ends $\frac{2}{3}$, the given diameter. This proportion will answer for driver-booms; but for main-booms, or all booms worked as the main-booms of cutters, the greater proportion of the given diameter should be at the inner end, as within the sheet the boom will have to sustain the greatest stress. These booms are rounded all the way through, except from 4 to 5 feet, where they are left square for the jaws, *g*, *g*.

A necking, *b*, is formed at the outer end, in length about the given diameter, and has a shive, *a*, for the sheet, and two hoops and eyes for the topping lift; *c*, for the outer, and *d*, for the inner.

On the Gaff.

The given diameter of the gaff is at the inner end, and the given length is set off on the upper part, beyond which 3 feet are allowed for displaying signals; the outer end is half the given diameter. The gaff is round, except in the place of the jaws, where it is left square.

Try-sail Gaff.

The try-sail gaff has the length set off from the upper part, but has no additional length allowed: the given diameter is at the inner end, and the outer end is $\frac{3}{5}$ of the given diameter. A ferrule and eye are fitted to the outer end, and the jaws are the same as those to the gaff.

On the Try-sail Mast.

The try-sail mast is in diameter from $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the mizen-mast; the larger proportion is commonly used to mizen-masts. This mast is rounded all the way through, and is of an equal diameter the whole length. The try-sail mast sometimes steps on a clasp hoop, with an eye to receive it; at other times on the boom, but most frequently on the partners, with a cleat round the heel; it is secured at the head, by an elm cap between the trestle-trees, or by a bolt or fid that passes through its upper part, and rests upon the trestle-trees. At the height for the saddle for the boom a chock is placed to the mizen-mast, which forms the saddle, and has a clasp hoop that passes round it and the mizen-mast.

	Ships of the Line.		Frigates.		Sloops.		Brigs.	
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Chock at the saddle, thick	5½	5½	5	5	4½	4½	4½	4½
Chock between the trestle-trees, thick	3½	3½	3	3	2½	2½	2½	2½
Saddle, thick	6½	6½	6	6	6	6	6	5
Clasp hoop, wide	4	4	4	4	3½	3½	4	3½
Clasp hoop, thick	7/16	7/16	7/16	7/16	⅜	⅜	7/16	⅜

On the Jib-boom.

The given diameter of the jib-boom is at the bowsprit cap, or at ⅓ from the inner end, to which distance it is made parallel, and the outer end is made ⅔ of the given diameter. The butt-end of the tree is worked inwards, and the jib-boom is left in the eight squares, three diameters from each end. At the outer end a necking is formed to an eight-square, one diameter and ⅙ in length; an inch and a half within the necking is a vertical shive, in length a diameter and ⅙, and at the extremity is a vertical half-shive upon the necking; about 2 inches within the inner part of the half-shive is an iron for the flying jib-boom; it is placed upon the middle starboard upper quarter eight-square, and stands up to an angle of 45°. At the inner end is a horizontal hole, ¾ of the diameter from the end; and ¾ of the diameter within the hole is a horizontal shive, in length the diameter and ⅙.

On the Flying Jib-boom.

The flying jib-boom, in general, steps in the cap; when its length is ⅔ the jib-boom, and ⅔ the given length of the flying jib-boom. The outer end is ⅔, and inner end ¾ of the given diameter, and its given diameter is at the iron or end of the jib-boom, from which place it is parallel to ⅔ the given length from the inner end; from these distances to the ends it is graduated according to the common method.

A necking is formed to one diameter within the outer end, and a vertical shive is placed 1 inch ½ within the necking; and at the inner end it is left in the eight squares to three diameters; and a hole, one diameter out, is bored horizontally.

Jib-boom and Flying Jib-boom in one.

When the jib-boom and flying jib-boom are in one, the length to the stops will be the length of the jib-boom; and from the stops to the outer end, will be $\frac{2}{3}$ the given length of the flying jib-boom. At the stops, the jib-boom will be $\frac{2}{3}$ the given diameter; and at the extreme end, $\frac{1}{2}$ what it is at the stops. The inner end is formed, and has a hole and shive, the same as the inner end of the jib-boom; and the outer end has a necking and shive, the same as to the outer end of the flying jib-boom; but within the stops are placed two vertical shives, the outer one 4 inches within the stops, and the inner one $\frac{3}{4}$ the diameter within the outer.

On the Studding-sail-booms.

The swinging or lower studding-sail-booms, are formed to the same proportion as driver-booms: they have a necking at the outer end, and a goose neck and ferrule at the inner end; they are in length $\frac{3}{5}$ of the lower yard.

Top and top-gallant studding-sail-booms, are in length $\frac{1}{2}$ the length of their respective yards; the given diameter is at $\frac{1}{3}$ from each end, between which they are made parallel. The ends are $\frac{2}{3}$ of the given diameter; at the outer and inner end is placed a ferrule and eye.

On the Furniture connected with the Lower Masts.—On the Knees.

(Fig. 8, Plate III.)

The knees, *b*, are of elm, and in length $\frac{4}{5}$ the length of the hounds, in breadth the diameter of the top-mast, before the fore part of the mast, and in thickness half the trestle-trees; their sides are placed without a fore-and-aft line, so that the fore and outer edges may be well with the champher on the trestle-trees, *b*, *b*, fig. 11. The lower end lets in, and forms an abutment within the champher of the hounds, $\frac{1}{10}$ the size of the mast at that place; and a hook is likewise formed of the same depth at the middle of the knee, the upper part of the after edge is well with the fore part of the mast.

The knees are bolted with four through bolts. The through bolts pass through the hounds, and are clenched on the after part; one is placed just below the two upper hound bolts, and one just above the two middle bolts, the other is placed in the middle between these two. For the sizes of bolts, see Tables, after masts.

An iron plate, *g*, is brought on each side of the mast to support the knees, just below the hound hoop, *h*, *h*, extending from the champher on the aft part of the hounds, to within 1 inch of the fore part of the knee; it is placed at such a height, that the two upper hound bolts may pass through it. This plate is bolted to the knees with two bolts, which are driven through, and clenched on the inside. An iron plate is likewise brought on their upper ends, and extends over the stops; this plate turns over the fore side of the knees about 4 inches, and has two short saucer-headed bolts driven into the fore side of the knees. In the hounds are driven, in the main-mast, two eye-bolts, one, K, for the fore-brace, and *l*, for the fore top-sail brace.

	SHIPS OF THE LINE.	FRIGATES.
Plates, thick	$\frac{3}{4}$ to $\frac{5}{8}$	$\frac{1}{2}$
Plates, broad	Half the breadth of the trestle-trees.	

On Tops, as formerly made. (Fig. 2, Plate III.)

Tops are in breadth $\frac{1}{3}$ the given length of the top-mast, and fore-and-aft $\frac{3}{4}$ their breadth, they have a square hole, which is $\frac{2}{5}$ of the breadth, for the main and fore, and for the mizen $\frac{2}{5}$ the breadth athwartships, and $\frac{4}{5}$ fore and aft.

The proportion for the breadth is given for the fore part, and the tops are commonly formed so as to be wider at the after part, 12 inches on each side, for the fore and main, and 9 inches for the mizen. This breadthening of the tops at the after part does not affect the bracing of the yards, and may be still increased to larger tops, while to small tops it is rather too much, as $\frac{1}{13}$ the breadth should not be much exceeded, and, in most cases, would give a proper degree of fan.

When the size of the tops is determined, it is layed off roughly on a floor, for preparing the boards of the flat; after this is done, two trestles are made to a convenient height for the workmen, and two of the fore-and-aft boards are laid on them, with the midship edge of the midship board, on each side, separate the size of the square hole. Two boards at the fore part, and two at the after part, are then laid across the fore-and-aft boards, to form the hole to the size the fore-and-aft way, when they are halved on each other, and nailed together, with the athwartship boards above the fore-and-aft; the remaining boards are then brought on and halved together, to make up the size of the top. The breadth abaft the hole is $\frac{1}{5}$ the length of the trestle-trees, which set off abaft the hole for the after wood, and it is from this distance that the size of the top fore and aft is set off, which size will give the breadth before the hole. The breadth before the hole, as commonly given to tops, is more than is necessary for any purpose that is required in the tops, and may be reduced $\frac{1}{5}$ to advantage, as it only causes the top-sails to be more chafed, and adds to the weight.

The fore part of the top is of an elliptical form, and is formed by different practical methods, according to the skill of the workman; the one most in use, is the common method by the revolution of a string that passes round two fixed points or foci. Draw the line *a b*, fig. 40, Plate III., to $\frac{1}{8}$ the breadth of the top abaft the fore part of the square hole for transverse diameter; then take the distance *a e*, the half breadth of the top, and set it off from the point *c*, or where the conjugate diameter cuts the fore part of the top, to cut the line *a b* in *d*, when *d d* will be the foci, at which places two nails are stuck in, and a line made to pass round *d d* to *c*, and strained tight, when the revolution of this line at *c*, passing round *d d*, will form an ellipsis, and give the curve *c e a*, or form of the fore part of the top. The line *a b*, is not always $\frac{1}{8}$ the breadth of the top abaft the fore part of the square hole; but more commonly $\frac{1}{12}$, which gives the quarters of the top at *e* too full, in consequence of which the top-sails are the more chafed when the yards are braced up.

When the boards of the flat of the tops *r*, fig. 29, Plate III., are halved together and fastened, and the top formed to its proper size, the rim *g* is brought on and nailed to them, and, on each side, the iron plates for the puttock plates are fixed and bolted. In spacing the holes for the puttock plates the foremost one is placed at the after part of the top-mast, the after one, as near to the after part of the top as possible, and the intermediate ones, at equal distances apart.

The timber or knees, *t*, are next brought on, and lapped on the rim. At the side and fore and after parts, they extend from the square hole to the battens, except one on each side of the middle, at the after part, which runs under the span pieces, and extends quite through. Those on the fore part extend from the square hole to the fore part of the top. Against the ends of the timbers on each side, and the after part, are placed battens, called the "side and after battens;" and between the timbers on the fore part are let in fillings. The span pieces *a d*, at the fore and after parts of the top, extend across the joint, when the top is in two parts, and fay on the rim, at which places the fillings at the fore part, and batten at the after part, are left out.

The upper cross-trees, *n n*, are placed immediately over the lower cross-trees, and extend the whole breadth between the side battens. Their ends lap on the rim, and are above it the depth of the side battens, and what they are reduced or tapered, commences from once their breadth within the square hole.

The halving of the flat at the tops and rim, is nailed with common nails, of a length just to have their points to turn on the under side; the knees or timbers are commonly fastened with timber nails, of lengths likewise for their points, just to turn on the under side of the top.

Size of Timber Materials in Ships' Tops.

Rate of Guns.	Tops.		Rims.		Knees.				Fillings.		Battens.		Stantions Board.		Cross-trees.		Span Pieces		Stantions.			Rails.		Iron
		Flat.	Thickness.	Breadth.	No	Thickness.	Moulded.		Thickness.	Moulded.	Thickness.	Breadth.	Thickness.	Breadth.	Thickness.	Breadth.	Thickness.	Breadth.	Length.	Size.		Thickness.	Breadth.	Diameter.
							Head	Point												Wood.	Iron.			
		in.	in.	in.		in.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ft. in.	ins.	in.	ins.	ins.	ins.
120 to 74	Main and Fore	3	1½	9	28	3	3¾	1¼	2¼	2¾	1½	2¾	1¼	9	5	10	5	9	3 0	3	—	3	4	1⅛
	Lower end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1⅜	—	—	—
	Upper end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
"	Mizen	2	1⅝	7½	22	2½	3¼	⅞	1½	2⅝	1¼	2⅝	1¼	7½	4	8	4	8	3 0	2½	—	2½	3½	—
50 to 42	Main and Fore	2½	1⅜	8	24	2½	3½	1	2	2½	1⅜	2½	1¼	8	4½	8½	4½	8	3 0	3	—	2½	3¾	1
	Lower end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1¼	—	—	—
	Upper end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	⅞	—	—	—
"	Mizen	2	1¼	7	20	2	3⅛	⅞	1⅜	2⅜	1¼	2⅜	1¼	7	4	6	4	7	3 0	2⅜	—	2½	3½	—
28 and Sloops	Main and Fore	2	1⅜	7	20	2	3⅛	⅞	1⅜	2⅜	1¼	2⅜	1¼	7	4	7½	4	7½	3 0	2⅜	—	2½	3½	¾
	Lower end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1⅛	—	—	—
	Upper end	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	¾	—	—	—
"	Mizen	2	1¼	6	16	2	3	¾	1¼	2	1¼	2	1¼	6	4	5	3½	6	3 0	2¼	—	2¼	3½	—
Brigs	Main and Fore	2	1¼	6	14	2	3	¾	1⅜	2	1½	2	1¼	6	4	5	—	—	3 0	2¼	—	2¼	3½	—
	Height of iron stantions to the centre of eye	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2 9	—	—	—	—	—

Number and Size of Iron Bolts in Ships' Tops.

Rate of Guns.	Tops.	Cross-tree Bolts.		Span Piece Bolts.	
		No.	Size.	No.	Size.
			in.		in.
120	Main and Fore ..	8	1⅛	8	⅞
"	Mizen	8	⅞	8	¾
104	Main and Fore ..	8	1⅛	8	¾
"	Mizen	8	⅞	8	¾
74	Main and Fore ..	8	1⅛	8	¾
"	Mizen	8	⅞	8	¾
50	Main and Fore ..	8	1	8	¾
"	Mizen	8	¾	8	¾
46 to 28	Main and Fore ..	8	1	8	¾
"	Mizen	8	¾	8	¾
Sloops	Main and Fore ..	8	⅞	8	¾
"	Mizen	8	¾	8	⅝
Brigs	Main and Fore ..	8	¾	—	—

The bolts are saucer-headed, and forelocked on the lower cross-trees, with an iron plate at the head and point; except the fore-mast span piece bolts, which are plain and cut off well with the under side.

Iron Plates for Puttock Plates, in Ships' Tops.

Rate of Guns.	Tops.	Length.		Breadth.	Thickness.	No. of Top-mast Shrouds.
		ft.	in.	in.	in.	in.
120	Main ..	10	0	4	½	6
"	Fore....	9	0	4	½	6
"	Mizen ..	8	0	3½	½	4
104	Main ..	9	10	4	½	6
"	Fore....	8	10	4	½	6
"	Mizen ..	7	10	3½	½	4
74	Main ..	9	10	4	½	6
"	Fore....	8	6	4	½	6
"	Mizen ..	7	0	3½	½	4
50	Main ..	9	0	4	½	5
"	Fore....	7	0	3½	½	5
"	Mizen ..	6	3	3½	½	4
46	Main ..	7	11	3½	½	4
"	Fore....	7	6	3½	½	4
"	Mizen ..	6	1	3	½	3
42	Main ..	7	7	3	½	4
"	Fore....	7	2	3	½	4
"	Mizen ..	6	1	2½	½	3
28	Main ..	6	6	2½	½	4
"	Fore....	6	2	2½	½	4
"	Mizen ..	5	0	2½	⅜	3
Ship sloops	Main ..	6	1	2½	⅜	4
" "	Fore....	5	9	2½	⅜	4
" "	Mizen ..	4	9	2½	⅜	3
18 Brig	Main ..	6	0	2½	⅜	4
" "	Fore....	5	7	2½	⅜	4
10 Brig	Main ..	3	1	2½	⅜	3
" "	Fore....	3	1	2½	⅜	3

The plates are fastened with a ½-inch saucer-headed rivet, on each side of dead eyes, and clenched on a plate on the under side of the top.

Weight of Ironwork in Ships' Tops.

Rate of Guns.	Tops.	Cwt.	Qrs.	lbs.
120	Main ..	3	1	14
"	Fore....	3	1	0
"	Mizen ..	1	2	17
104	Main ..	3	0	19½
"	Fore....	3	0	3
"	Mizen ..	1	2	4
74	Main ..	3	0	2
"	Fore....	2	3	15
"	Mizen ..	1	1	25
50	Main ..	2	2	18
"	Fore....	2	2	0
"	Mizen ..	1	1	9½
46	Main ..	2	1	14½
"	Fore....	2	1	0
"	Mizen ..	1	0	25
42	Main ..	2	1	0
"	Fore....	2	0	14
"	Mizen ..	1	0	19
28	Main ..	1	3	6½
"	Fore....	1	2	11
"	Mizen ..	1	0	6
Ship sloops	Main ..	1	3	0
" "	Fore....	1	2	16
" "	Mizen ..	1	0	2
18 Brig.	Main ..	1	2	10
" "	Fore....	1	1	25
10 Brig	Main ..	1	1	14
" "	Fore....	1	1	1

On the new Made-tops. (Fig. 1, Plate III.)

In order to reduce the chafing of the top-sails against the top rim, as the yards are now braced sharper up, the tops are made narrower fore-and-aft,—in a first-rate about 16 inches. (See Article, old Tops.) At the fore cross-tree the tops are athwartships $\frac{1}{3}$ the whole length of the top-mast; but they are wider at the after part, or are made to *fan*, so as to be $\frac{9}{25}$ of the length of the top-mast; and fore-and-aft they are $\frac{2}{3}$ of their breadth at the fore cross-tree. The tops are now formed without knees or timbers, and with the thickness increased. For ships of the line the boarding, *r*, is now 3 inches; for frigates it is $2\frac{3}{4}$ inches; for sloops and large brigs, $2\frac{1}{2}$ inches; and for small brigs and vessels 2 inches. These tops are halved at the square or lubber-hole, *x*, as other tops; but, instead of having timbers, the boards are united by three bolts on each side in the wake of the square hole, driven athwartships, as shown by dotted lines, *b*. The rims, *g*, and iron-plates, *y*, for the puttock shrouds are placed as shown in the drawing. The square hole, *x*, is in breadth fore-and-aft, $\frac{5}{13}$ of the fore cross-trees, and extends from the fore side of the fore cross-tree to the after side of the after cross-tree; and athwartships it is $\frac{5}{13}$ of the fore cross-tree. A scuttle is now formed in the top (fig. 1), for striking the top-gallant mast, and as *r*, in the battened tops, figs. 3 and 4. The breadth from the after part of the top to the after part of the after cross-tree is $\frac{3}{14}$ of the top fore-and-aft. On the after rim of the top, four or five sockets, *k*, are let in to receive the top stantions, which are in diameter as given in the Tables, page 252; the height of the top rail, which is now generally made of iron, and the diameter as given in the Tables, page 252. On the fore part of the top a hole, *z*, is cut for the slings of the yard; and on the after part of the hole is fixed a bolster, *s*, which is sometimes made of iron, but more commonly of hard wood, as African oak. The foremost hole, *m*, for the puttock plates is fixed at the centre of the top-mast; the after hole is about 6 inches from the after part of the top; and the intermediate ones are equally spaced. The upper cross-trees, *n*, are brought immediately over the lower cross-trees, and are bolted with four forelock bolts in each. Small vessels generally have their tops formed as figs. 3 and 4, with either gratings or battens, *s*, *s*, *s*, and the piece, *o*, that unites the fore, *g*, and after rim, *b*. The mizen tops are usually reduced, as is explained for the old tops, fig. 2.

On the Tops of Merchant Ships. (Figs. 5, 6, and 7, Plate III.)

In forming the top, fig. 5, the boarding, *r*, *r*, *r*, is commonly 1 inch thick, brought on the cross-trees, shown by dotted lines, *b*, *b*; and the rim, *g*, *g*, 2 inches thick on the boarding which forms the outline of the top. To receive the short boarding on the after and fore sides of lubbers'-hole, *f*, the framing, *e*, is formed, iron plates, *c*, are let in for the puttock plates. The batten tops, fig. 7, are formed of battens commonly about 3 inches wide and $1\frac{1}{2}$ inch thick, nailed on the cross-trees, *b*, *b*, *b*, when a rim, forming the outline rim *c*, 8 inches broad and $1\frac{1}{2}$ thick, is brought over them, extending to the after cross-tree, and on the aft side a fore batten is brought on their ends. These tops are sometimes formed with a rim of elm board fixed on the cross and trestle trees, *a*, to give the external form, and a cant of oak half the breadth of the rim is brought and nailed on the rim; the battens are about 5 or 6 inches wide and an inch thick, and are fitted between the cant, about their breadth asunder.

On the Cross-trees and Trestle-trees. (Fig. 8, Plate III.)

The trestle-trees, *a*, are in length $\frac{13}{14}$ of the top, or to reach to the overhang of the top rim; their depth $\frac{1}{8}$ of an inch in a foot of their length; and their breadth $\frac{2}{3}$ of their depth. The snape on the lower side from $\frac{1}{2}$ the depth of the trestle-tree down to $1\frac{3}{4}$ of the depth in length from the end, $1\frac{3}{7}$ of the depth from the after end; the ends are rounded horizontally to a semicircle.

The cross-trees, *n*, *n*, are in length $\frac{15}{16}$ of the top athwartships, or extend to the overhang of the top rim; they are at the same breadth as the trestle-trees, and their depth $\frac{2}{3}$ of their breadth, exclusive of the lubber wood (the lubber wood is a projecting wood left on the upper part of the cross-trees, for keeping the top in its position), which is left up from $1\frac{1}{2}$ to 2 inches, and its length the same as the square hole in the top. The cross-trees snape from $\frac{1}{2}$ their depth down to once their breadth, from the lubber wood; they have their ends rounded horizontally to a semicircle.

The trestle-trees, if more than 9 inches in breadth, have two strengthening bolts driven down about 2 inches from each side of each score for the cross-trees; if less than 9 inches, only one. The cross-trees, if more than 9 inches, have two bolts driven down about 2 inches from each end of the lubber wood, and $2\frac{1}{2}$ inches without the score for the trestle-trees; if less than 9 inches in breadth, they have only one at each of these places; they have likewise one strengthening bolt driven horizontally, just clear of the round: the whole of these bolts are saucer-headed and clenched. The trestle-trees are faced upon the mast $\frac{1}{8}$ of their thickness, and are bolted with two bolts, which pass through both trestle-trees, and are clenched.

They have a plate, *e*, fig. 8, brought on their upper part for the top-mast fid.

To space the Cross-trees.

The after edge of the foremost cross-tree is commonly once and $\frac{6}{37}$ of the diameter of the top-mast, from the fore part of the chock; and the distance of the fore edge of the foremost cross-tree to the after edge of the aftermost cross-tree is equal to the square hole of the top. In letting down the cross-trees, the score is taken out $\frac{2}{3}$ of their depth from the trestle-trees, and the remaining $\frac{1}{3}$ out of the cross-trees; sometimes, however, the cross-trees are let down into trestle-trees by taking a score out of them $\frac{1}{7}$ their depth, and out of the trestle-trees $\frac{2}{5}$ their depth; they are always made to strengthen down a little, for the ease of taking them out of their places and replacing them at the mast head. When they are in their places, one saucer-headed bolt is driven through each, and fore-locked on the under side of the trestle-tree.

It is more common, in spacing the cross-trees, to place the after edge of the after cross-tree $\frac{1}{5}$ the length of the trestle-trees from its after end, and then determine the fore side of the foremost cross-tree by the size of the square hole of the top.

Dimensions of the Cross-trees and Trestle-trees, according to the Length of the Top-mast.

Given length of the Top-masts.	CROSS-TREES.													TRESTLE-TREES.											
	Length of the Fore-most.		Length of the After.		Breadth.	Depth.	Bolts.							Length.		Breadth.	Depth.	Bolts.							
							Fastening.				Strengthening.							Fastening.				Strengthening.			
							Number.	Length.		Diameter.	Number.	Length.	Diameter.					Number.	Length.		Diameter.	Number.	Length.		Diameter.
ft.	ft.	ins.	ft.	ins.	ins.	in.	No.	ft.	ins.	in.	No.	ins.	in.	ft.	ins.	ins.	ins.	No.	ft.	ins.	in.	No.	ft.	ins.	in.
75	23	5¼	24	5¼	13	8⅝	4	1	10½	1⅜	16 4	10⅛ 13	¾	17	4½	13	19⅝	2	4	5	1⅜	16	1	7⅞	¾
74	23	1½	24	1½	12¾	8½	4	1	10¼	1⅜	16 4	10 12¾	¾	17	2	12¾	19¼	2	4	4	1⅜	16	1	7½	¾
73	22	9¾	23	9¾	12⅝	8⅜	4	1	10	1⅜	16 4	9⅞ 12⅝	¾	16	11¼	12⅝	19	2	4	3	1⅜	16	1	7⅛	¾
72	22	6	23	6	12⅜	8¼	4	1	9¾	1⅜	16 4	9¾ 12⅜	¾	16	8	12⅜	18⅞	2	4	2½	1⅜	16	1	6¾	¾
71	22	2	23	2	12¼	8⅛	4	1	9½	1⅜	16 4	9½ 12¼	¾	16	5¾	12¼	18½	2	4	2	1⅜	16	1	6½	¾
70	21	10½	22	10½	12⅛	8	4	1	9¼	1⅜	16 4	9⅜ 12⅛	¾	16	3	12⅛	18¼	2	4	1½	1¼	16	1	6¼	¾
69	21	6¾	22	6¾	12	8	4	1	9	1⅜	16 4	9¼ 12¼	¾	16	0	12	18	2	4	1	1¼	16	1	5⅞	¾
68	21	3	22	3	11¾	7⅞	4	1	8¾	1⅜	16 4	9⅛ 11⅞	¾	15	9	11¾	17¾	2	4	0½		16	1	5⅝	¾
67	20	11¼	21	11¼	11½	7¾	4	1	8½	1⅜	16 4	9¼ 11⅜	¾	15	6⅜	11½	17⅜	2	4	0	1¼	16	1	5⅜	¾
66	20	7½	21	7½	11⅜	7½	4	1	8⅛	1⅜	16 4	9⅛ 11⅜	¾	15	3¼	11⅜	17⅛	2	3	11	1⅛	16	1	5⅛	¾
65	20	0¾	21	0¾	11¼	7½	4	1	7¾	1¼	16 4	9 11¼	¾	15	1	11¼	16⅞	2	3	10	1⅛	16	1	4⅞	¾
64	19	10	20	10	11	7¼	4	1	7½	1¼	16 4	8⅞ 11	¾	14	10¼	11	16½	2	3	9	1⅛	16	1	4⅝	¾
63	19	8¼	20	8¼	10⅞	7¼	4	1	7¼	1¼	16 4	8¾ 10⅞	¾	14	7⅜	10⅞	16⅜	2	3	8½	1⅛	16	1	4⅜	¾
62	19	4½	20	4½	10¾	7⅛	4	1	7	1¼	16 4	8⅝ 10¾	¾	14	4½	10¾	16⅛	2	3	8	1⅛	16	1	4⅛	¾
61	19	0¾	20	0¾	10⅝	7⅛	4	1	6¾	1⅛	16 4	8½ 10⅝	¾	14	1¾	10⅝	15⅞	2	3	7½	1⅛	16	1	3⅞	¾
60	18	9	19	9	10⅜	6⅞	4	1	6½	1⅛	16 4	8⅜ 10½	¾	13	11	10⅜	15⅝	2	3	7	1	16	1	3⅝	¾
59	18	5¼	19	5¼	10¼	6⅞	4	1	6¼	1⅛	16 4	8¼ 10⅜	¾	13	8¼	10¼	15⅜	2	3	6½	1	16	1	3¼	¾
58	18	1½	19	1½	10⅛	6¾	4	1	6	1⅛	16 4	8⅛ 10⅛	¾	13	5½	10⅛	15⅛	2	3	6	1	16	1	3	¾
57	17	9¾	18	9¾	10⅛	6¾	4	1	5¾	1⅛	16 4	8 9⅞	¾	13	2¾	10⅛	15⅛	2	3	5	1	16	1	2¾	¾
56	17	6	18	6	9¾	6½	4	1	5½	1⅛	16 4	7⅞ 9¾	¾	13	0	9¾	14⅞	2	3	4	1	16	1	2½	¾
55	17	2½	18	2½	9½	6⅜	4	1	5¼	1⅛	16 4	7¾ 9⅝	¾	12	9	9½	14¼	2	3	3	1	16	1	2¼	¾
54	16	10½	17	10½	9⅜	6¼	4	1	5	1	16 4	7⅝ 9⅜	¾	12	6½	9⅜	14⅛	2	3	2	1	16	1	2	¾
53	16	6¾	17	6¾	9⅛	6⅛	4	1	4¾	1	16 4	7½ 9¼	¾	12	3½	9⅛	13¾	2	3	1	1	16	1	1¾	¾
52	16	3	17	3	9⅛	6⅛	4	1	4½	1	16 4	7⅜ 9⅛	¾	12	1½	9⅛	13¾	2	3	0	1	16	1	1½	¾

Dimensions of the Cross-trees and Trestle-trees, according to the Length of the Top-masts. (Continued.)

Given length of the Top-masts.	CROSS-TREES.													TRESTLE-TREES.											
	Length of the Fore-most.		Length of the After.		Breadth.	Depth.	Bolts.							Length.		Breadth.	Depth.	Bolts.							
							Fastening.				Strengthening.							Fastening.				Strengthening.			
							Number.	Length.		Diameter	Number.	Length.	Diameter.					Number.	Length.		Diameter.	Number.	Length.		Diameter.
ft.	ft.	ins.	ft.	ins.	ins.	in.	No.	ft.	ins.	in.	No.	ins.	in.	ft.	ins.	ins.	ins.	No.	ft.	ins.	in.	No.	ft.	ins.	in
51	15	11½	16	11½	9	6	4	1	4¼	1	16 4	7⅜ 9	¾	11	11	9	13⅛	2	2	11	1	16	1	4¼	¾
50	15	7½	16	7½	8¾	5⅞	4	1	4	1	16 4	7¼ 8⅞	¾	11	7	8⅝	12⅞	2	2	10½	1	16	1	1	¾
49	15	3¾	16	3¾	8½	5⅝	4	1	3¾	1	16 4	7⅛ 8¾	¾	11	4½	8½	12¾	2	2	10	1	16	1	0¾	¾
48	15	0	16	0	8¼	5½	4	1	3½	1	16 4	7 8½	¾	11	1¼	8¼	12½	2	2	9	1	16	1	0½	¾
47	14	8	15	8	8⅛	5⅜	4	1	3⅜	1	16 4	6⅞ 8¼	¾	10	10	8	12⅜	2	2	8½	1	16	1	0¼	¾
46	14	4¼	15	4¼	8	5¼	4	1	2¾	⅞	16 4	6¾ 8	¾	10	8	8	12	2	2	8	1	16	1	0	¾
45	14	0¾	15	0¾	7⅝	5⅛	4	1	2½	⅞	16 4	6⅝ 7⅞	¾	10	5¼	7½	11¾	2	2	7	1	16		11¾	¾
44	13	9	14	9	7⅜	5⅛	4	1	2¼	⅞	16 4	6½ 7¾	¾	10	2¾	7⅝	11½	2	2	6½	1	16		11½	¾
43	13	5	14	5	7½	5	4	1	2	⅞	8 4	6½ 7⅝	¾	9	11¾	7½	11⅛	2	2	6	⅞	8		11¼	¾
42	13	1½	14	1½	7¼	4⅞	4	1	1¾	⅞	8 4	6⅜ 7½	⅝	9	9	7¼	10⅞	2	2	5	⅞	8		11	⅝
41	12	9¾	13	9¾	7⅛	4¾	4	1	1½	⅞	8 4	6¼ 7¼	⅝	9	6	7⅛	10⅝	2	2	4	⅞	8		10¾	⅝
40	12	6	13	6	6⅞	4⅝	4	1	1¼	⅞	8 4	6⅛ 7	⅝	9	3¼	6⅞	10⅜	2	2	3½	⅞	8		10½	⅝
39	12	2¼	13	2¼	6¾	4½	4	1	1	⅞	8 4	6 6¾	⅝	9	0½	6¾	10⅛	2	2	3	⅞	8		10¼	⅝
38	11	10½	12	10½	6½	4¼	4	1	0¾	⅞	8 4	5⅞ 6½	⅝	8	9¾	6½	9⅞	2	2	2½	⅞	8		10½	⅝
37	11	6¾	12	6¾	6⅝	4¼	4	1	0½	⅞	8 4	5¾ 6¼	⅝	8	7	6⅜	9⅝	2	2	2	⅞	8		9¾	⅝
36	11	3	12	3	6¼	4⅛	4	1	0¼	⅞	8 4	5⅝ 6	⅝	8	4	6¼	9⅜	2	2	1	⅞	8		9½	⅝
35	10	11¼	11	11¼	6⅛	4⅛	4	1	0	¾	8 4	5½ 5⅞	⅝	8	1½	6⅛	9⅛	2	2	0½	⅞	8		9¼	⅝
34	10	7½	11	7½	5⅞	3⅞	4		11¾	¾	8 4	5⅜ 5¾	⅝	7	10½	5⅞	8¾	2	2	0	¾	8		9	⅝
33	10	2¾	11	2¾	5⅝	3¾	4		11½	¾	8 4	5¼ 5⅝	⅝	7	7¼	5⅝	8½	2	1	11	¾	8		8¾	⅝
32	10	0	11	0	5½	3⅝	4		11¼	¾	8 4	5 5½	⅝	7	5	5½	8⅜	2	1	10	¾	8		8½	⅝
31	9	8¼	10	8¼	5¼	3½	4		10¾	¾	8 4	4⅞ 5¼	⅝	7	0½	5¼	7⅛	2	1	9½	¾	8		8¼	⅝
30	9	4½	10	4½	5¼	3⅜	4		10½	¾	8 4	4¾ 5⅛	⅝	6	11½	5¼	7⅞	2	1	9	¾	8		7⅞	⅝
29	9	0¾	10	0¾	5	3⅜	4		10	⅝	8 4	4⅝ 5	⅝	6	8¼	5	7½	2	1	8½	¾	8		7¾	⅝
28	8	9	9	9	4¾	3¼	4		9½	⅝	8 4	4½ 4¾	⅝	6	5½	4¾	7¼	2	1	8	¾	8		7½	⅝
27	8	5¼	9	5¼	4⅝	3⅛	4		9¼	⅝	8 4	4⅜ 4½	⅝	6	3	4⅝	7	2	1	7½	¾	8		7¼	⅝
26	8	1½	9	1½	4½	3	4		9	⅝	8 4	4¼ 4⅜	⅝	6	0½	4½	6¾	2	1	7¼	¾	8		7	⅝
25	7	10	8	10	4¼	2⅞	4		8½	⅝	8 4	4⅛ 4¼	⅝	5	9½	4¼	6⅝	2	1	7	¾	8		6¾	⅝

The above Table is formed for the tops to be the original breadth; but in consequence of the alterations which have been made in the breadth fore-and-aft of the tops, the length of the cross and trestle trees is now somewhat different, as the following proportions will show. The after cross-tree is now $\frac{30}{31}$ of the top at the after part; and the fore cross-tree is $\frac{60}{61}$ of the breadth of the top at the fore part of the square hole. The length of the trestle-trees is equal to the breadth of the top fore-and-aft, or $\frac{3}{8}$ of the whole length of the top-mast. The depth of them is $\frac{13}{16}$ of an inch to every foot of their length; and the breadth is $\frac{2}{3}$ of the depth. The breadth of the cross-trees is the same as that of the trestle-trees; and their depth is $\frac{2}{3}$ of their breadth. While the lengths given in the Table may be deviated from, to answer to the new tops, the size of the cross and trestle trees will be sufficiently near for their respective lengths.

On the Hounds Pieces for Cutters.

The hounds pieces are formed, coaked, and fastened to the mast, the same as to single-tree masts, but their length is only $\frac{1}{3}$ the length of the mast head, to give more hoist to the gaff, and to prevent the jaws from catching; in case the peak hallyards are let go, before the main hallyards are settled, the hounds pieces are brought nearly to the aft side of the mast, and rounded off with it.

On the Stretchers or Cross-trees of Cutters.

The cross-trees are in length $\frac{1}{3}$ the length of the top-mast, in breadth $\frac{7}{12}$ the diameter of the top-mast, and in depth $\frac{5}{7}$ of their breadth; they are tapered from $\frac{1}{8}$ their length on each side the middle, reducing their depth at the ends, from the lower side, to $\frac{2}{3}$ of the middle, and their breadth at the ends, from the fore side of the after, and aft side of the fore, to $\frac{6}{7}$ of the middle; their ends are rounded off to a semicircle. The cross-trees have no score taken out of them, but let down upon the cap about $\frac{1}{6}$ of their depth, and are bolted with two saucer-headed bolts that forelock on the under side of the cap.

On the Bolster of Cutters.

A bolster is fitted on the upper part of the cap, which extends from the fore side of the after cross-tree, to the after part of the top-mast.

On the Bolsters of Ships and Brigs. (Figs. 1, 2, 3, 4, 8, and 17, Plate III.)

The bolsters, *c*, and *d*, figs. 18 and 20, extend from the fore part of the chock, to the fore side of the after cross-tree; they are of the same breadth as the trestle-trees, so that they overhang what the trestle-tree is let in, and up and down 1 inch less; they are rounded from edge to edge. The bolsters are nailed with two nails driven into the trestle-tree, and considerably within the wood, to prevent them cutting the rigging.

On the Battens on the Mast Head. (Figs. 8 and 10, Plate III.)

The battens, *f*, *f*, *f*, on the mast head have their lower ends well with the lower part of the lowest hoop, and extend ¾ up the mast head, having their upper ends faying close to the mast, and snaped off, almost to a sharp, to prevent the rigging from catching when getting it over. Single-tree masts without cheeks, have four placed over the middle of the calf's tongue; all masts that are cheeked have eight, placed so as best to prevent the rigging from touching the hoops. The breadth of the battens are, to masts from 17 to 22 inches in diameter, 2½ inches; from 22 to 30 inches, 3½ inches; and from 30 inches in diameter upwards, 4 inches in breadth; and in thickness, 2½ battens, 1¼ inch; and above 2½ in breadth, 1½ inch. The mast-head battens are fastened with two nails between each hoop.

On the Chock. (Figs. 1, 2, and 8, Plate III.)

A chock is brought on the fore side of the mast between the trestle-trees, and of the same depth.

It is fore-and-aft ½ an inch to a foot of the given length of the mast head, or add to the taper of the mast head the chock or space between the round hole of the cap.

On the Tenons or Heeling of Masts.

The tenons to main and fore masts are athwartships ⅗, and fore-and-aft ⅖ of the given diameter; and mizen-masts, ⅕ athwartships, and ⅗ fore-and-aft. The length of the tenon for all masts is 6 inches; they are ¼ of an inch smaller at the lower part than at the shoulder. In general, a shoulder 3½ inches on, and 8 inches up, is taken on the fore and after sides of the masts, to receive a plate, for lifting the masts with the machine.

Caps on the Lower-masts. (Fig. 9, Plate III.)

The caps formerly on the lower-masts were mostly of elm, and in breadth twice, and in thickness ⅚ the diameter of the top-mast. The hole for the top-mast is sweeped to once the diameter, ¾ of an inch for the thickness of the leather, and $\frac{1}{8}$ of an inch for play, and its fore part is placed once the depth of the cap from the fore end; from the after part of this hole, to the fore part of the square hole, is half the taper of the mast head, and the thickness of the chock between the trestle-trees, this hole is $\frac{9}{10}$ fore-and-aft, and $\frac{8}{10}$ athwartships, of the size of the mast head; the fore part and two sides of the hole, are made $\frac{3}{4}$ of an inch in a foot less at the upper part, or what is technically termed strengthening down $\frac{3}{4}$ of an inch to a foot; and the after part is square or made perpendicular through to the under side. The wood left beyond the after part of the square hole is equal to the depth of the cap; the four corners of the cap are rounded off to an arc of a circle, letting the ends and side be tangents to it, and the radius $\frac{1}{5}$ the breadth of the cap. Caps are now bound with iron, and are in breadth once and $\frac{3}{4}$ the diameter of the top-mast, and in depth $\frac{2}{3}$. This proportion is sufficiently large, though they are now commonly made in ships of war, their breadth two diameters of the top-mast, and 1 inch, and their depth 1 inch less than the diameter of the top-mast; their depth is commonly reduced on the edge of the cap $\frac{1}{12}$, to make it as light as possible. The iron band round the cap is commonly $\frac{1}{3}$ its depth, and varies from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch in thickness, according to the size of the ship.

The wood now before the round holes is only $\frac{2}{3}$ the depth of the cap, with a view to make it as light as possible. The fore part of the square hole strengthens down 1 inch to a foot, and each side $\frac{3}{8}$ of an inch to a foot, and the after part is square.

The caps, when made of two pieces, are united at the middle, and have three circular coaks of 3½ inches in diameter, one placed in the middle between the holes, and one at each end about the middle, between the holes and the extremities.

Caps, whether made or in one piece, have horizontal strengthening bolts driven through them and clenched; caps to masts below 32 inches in diameter have six; caps to masts 32 inches in diameter, and all above, have eight bolts. These bolts are so placed that two may pass between the two holes; and if only six, two between the holes and ends, in the same vertical line; but if eight bolts, three are placed at each end, two about 2½ inches from the holes, and one between these and the end of the cap, in the middle up and down. The whole of the bolts that are placed in the same vertical line, are $\frac{1}{4}$ the depth of the cap from the edges.

These caps have four eye-bolts, *p*, driven from the under side for the top rope pendants, with their eyes athwartships and clenched, upon plates on the upper part; two are placed in the same athwartship line, with the centre of the square hole, and two with the centres in the same athwartship line, as the fore part of the round hole. Fore-and-aft they are placed in the middle, between the side of the holes, and the side of the caps. The two eye-bolts that are opposite the square hole, have their eyes placed on one side of the cylindrical part of the bolt, in room of the centre, that the blocks may the better clear the mast head. The caps have now a plate, *x*, on the upper side for the lower lifts, with an eye in each end; it is commonly in breadth $\frac{1}{3}$ the depth of the cap, and varies in thickness from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch, according to the size of the ship; it is bolted with three bolts. The main cap has two holes, *s*, through the after part for the mizen stay.

On the Caps fixed on the Masts of Cutters or Schooners. (Fig. 43, Plate III.)

Cutters and schooners have in general two caps; one fixed upon the stops for receiving the lower end of the top-mast, is called the lower cap, *b*, and is made to answer as trestle-trees for securing the cross-trees or stretcher to; and one fixed upon the mast head, called the upper cap, *a*, which is in general of iron.

On the Lower Cap. (Fig. 43, Plate III.)

The lower cap, *b*, is in length twice and $\frac{3}{4}$ the diameter of the top-mast, and the diameter of the mast head at the stops; the breadth is three diameters of the top-mast, and the depth $\frac{1}{3}$ of its breadth. The cap is made to clasp the mast, and to extend abaft it $\frac{7}{12}$ the diameter of the top-mast, or so as to receive the after cross-tree. The fore part of the hole for the top-mast is placed $\frac{3}{4}$ of an inch more than $\frac{7}{12}$ the diameter of the top-mast from the fore end, or so that $\frac{1}{2}$ the diameter of the top-mast may be left between the after part of the hole and the fore part of the mast. The fore part of the cap is rounded to a semicircle, and an iron plate is made to clasp it, and to extend as far aft as the fore part of the mast. Through this plate a bolt is driven, which passes through the middle of the short wood left between the after part of the hole for the top-mast, and fore part of the mast. This plate, which is in breadth $\frac{3}{5}$ the depth of the cap, is let in so as to be fair with the outside; and, frequently, to make the cap lighter, it is reduced in breadth $1\frac{1}{4}$ inch on each side, from the fore part of the mast forward.

From the under side of the cap two eye-bolts are driven, with their eyes lying athwartships, in the middle, between the hole and the outside of the cap, and immediately opposite the middle of the hole for the top-mast.

These bolts are clenched on the upper side upon plates. The cap is bolted in general with two bolts that pass through the mast; and that the cap may have a proper bearing where the bolts pass through, the stops are continued to the upper part of the cap, and formed on the fore side to an eight-square, and on the aft side square, so as to form a tangent to the round of the mast above the stops.

On the Upper Cap.

The upper cap, *a*, is in depth about $\frac{7}{13}$ the diameter of the top-mast. The part that lets on the mast head is square, with a small portion of the angles taken off, and of such size as to be inscribed within the circumference of the mast head. The fore part is a circle, placed so that the top-mast may lie parallel to the mast head.

The iron that unites the two parts is formed square, and half the diameter of the top-mast. Two eyes are frequently placed on the outside of the round part of the cap, one on the fore, and one on the after quarter, or so as to form an angle of 45° with a fore-and-aft line; but it is found more convenient to do away with one of these eyes, and to have a shive-hole for the top rope, to the same angle, through the mast head, with its upper part about 2 inches below the upper hoop.

To let on the Caps of the Lower-masts.

The caps to the lower-masts shoulder on each side and on the after part. In proceeding to let them on, first set down from the mast head the depth of the cap, and square it from the middle lines on the four sides of the mast, or square it on the two sides and look the other two out of winding with them; this being done, take the bevelling of the fore part of the hole from the under side of the cap, and apply the stock of the bevel, fore-and-aft ways, to the lines just got upon the mast, wearing off at the fore side of the mast at their depth, and marking by the tongue; the hole is cut, so that all that the cap strengthens down, is the fore-and-aft ways, taking off that from the fore side, at the upper part; as by taking the after part parallel to the middle line, it will better resist the weights that act on the fore side of the cap. From the hole thus cut, take the size fore-and-aft at the lower part by means of a stick, and as the cap is not supposed to go down to the shoulders, on the first letting on within an inch and a half, apply the stick upon the mast, at that distance up from the place of the lower part of the cap, keeping one end well with the line marked by the bevelling of the fore part of the hole. Next draw a parallel line round the hole 1½ inch from the upper part of the cap, and fit a stick to its size at that height; this stick apply to the head of the mast; when this is done, trim through the fore and after parts of the tenon, to the sizes thus obtained. The size of the tenon athwartships is obtained in the same manner, and applied at the same heights as for the fore-and-aft way, only it is set off equally on each side of the middle line. The shoulders are not left square, but are taken down on the outside to prevent the water lodging on them.

On the Framing of the Mast Heads of Steam-vessels. (Figs. 22 and 24, Plate III.)

The framing of the fore-mast, fig. 22, has two cross-trees, *b*, *b*, *b*, having their lengths—the foremost one $\frac{1}{3}$ the hounded length of the top-mast, and the after one 2 feet longer than the foremost one. These cross-trees are curved aft, about equal to the diameter of the top-mast, when a piece of timber can be obtained well grown. The trestle-trees, *a*, *a*, with the cross-trees, form the framing, and have in connection with them, the curved cross-tree, *e e*, which is fixed on the fore end of the trestle-trees, and makes a curve to the outer end of the foremost cross-tree, having a connecting piece, *d*, bolted on its after side with four bolts, and an iron strap, *k*, over each end. Between the cross-trees the gratings, *m*, are fixed and supported by two iron plates, *r*, *r*, for the men to stand upon. In the ends of the cross-trees are fixed rollers, *x*, *x*, for the top-mast rigging, and between the mast and after cross-tree a fixed block, for the throat hallyards, a hole, *y*, is likewise made between the fore cross-tree and connecting piece for the slings of the yard, and the bolster, *c*, is brought on the trestle-tree for the lower rigging to lay over.

The framing to the main-mast, fig. 24, has two cross-trees, *b*, *b*, and two trestle-trees, *a*, *a*, combined together. The cross-trees are in length —the foremost one so as to carry the top-mast shroud 2 feet without a straight line from the stops to the outer part of the gunwale, the after one is 2 feet longer than the foremost one. The cross-trees are separate, so as to give a sufficient space for the block, *d*, for the throat hallyards, the mast, the chock, and diameter of the top-mast, T, leaving likewise 1 inch for the heeling. The trestle-trees extend their breadth before the foremost cross-tree, and the same abaft the after cross-tree. The bolsters, *c*, *c*, are brought on the trestle-trees for the lower rigging, and rollers, *s*, *s*, are fixed in the ends of the trestle-trees for the topmost rigging.

The framing to the main-mast of brigantines, fig. 20, has two long cross-trees, *a, a,* and a cross-tree, *b;* the long cross-trees are apart the size of the mast head at the stops, and the short cross-tree is before the foremost cross-tree, the diameter of the heel of the top-mast, T, and 1 inch for the heeling; the two long cross-trees, *a, a,* are in length the same as explained for the main-masts of steamers. Between the trestle-trees at the fore part of the short cross-tree a chock is placed to receive an iron band, *c,* fig. 18, which passes round to the after part of the trestle-trees. The cross-trees have rollers in their ends, *g, g,* for the top-mast rigging, and have bolsters *d, d,* for the lower rigging.

On the Furniture connected with the Bowsprit.—On the Bees. (Fig. 39, Plate III.)

The bees to bowsprits are now, in ships of war, done away with; when applied, they were in length from the aft side of the cap to the fore part of the hance, in breadth ½ the given diameter of the bowsprit, and in thickness ¼ their breadth at the edge close to the bowsprit, but ¼ their thickness less than this at the outer edge. Their upper sides to coincide with the upper part of the bowsprit at the inner edge, and to stand up from a level their thickness and 1 inch. The after and outer corners are rounded to an arc of a circle, of such a radius that the after end may be a tangent to it at ⅓ in from the outer edge.

The bees are bolted with three through bolts, and are clenched upon the opposite side of the bowsprit, with the after one placed so as just to clear the fore side of the after head hoop, the foremost one 4 inches from the fore end, the other in the middle between these two. On the outer part of the bees, close to the after bolts, is a small shive, commonly for the fore-top bowline, on each side, the thickness of the bees, and ⅙ in length, standing outwards at its after end 1½ inch.

On the Bee Blocks.

The bee blocks, *d,* are placed, one on each side of the bowsprit, close under the bees. They were in length upon the upper part half the length of what the bees were, their depth ⅓ their length, and their thickness twice the thickness of the shive. The foremost one is placed on the starboard side for the fore top-mast stay, and abuts against the cap, and has the fore end rounded off what it projects beyond the cap, making the fore part of the shive hole well with the aft side of the foremost head hoop. The larboard block for the fore top-mast spring stay is placed with its fore end in the same athwartship line, with the after part of the shive hole of the starboard block. They have a small round taken off their after and outer corners. They are now the same length as was formerly given to the bees, *d*, fig. 39 (see Single-tree Bowsprit), are fixed on the head, as shown by *g*, and have three shive holes in each, *e*, *c*, for the fore bowline, *d*, *d*, fore-top bowline, *c*, fore top-mast stay, and spring stay, *f*, *f*, holes for the jaw rope for dolphin striker.

The blocks are bolted with two bolts in each. The after bolt in the starboard is made to answer for the foremost bolt of the larboard shive.

Saddle for the Jib-boom. (Fig. 39, Plate III.)

The saddle, *b*, for the jib-boom is placed with its after part ⅓ the length of the jib-boom from the fore part of the cap, or to answer with the square wood, *b*, left for the middle stops, *a*; it is in length ½ the diameter of the bowsprit; its width is ½ the diameter of the jib-boom, and in thickness, at the middle, so that the jib-boom may lie parallel with the middle line of the bowsprit. It is fastened with one rag-pointed bolt in the middle, and a nail in each end; but stops are now left on the bowsprits for the bobstays and collars, *a*, *a*, *a*, to project about 2 to 2½ inches, as shown in section L, on the squares of one of these projections, as *b*, the saddle for the jib-boom is fixed.

Cleat for the Slings of the Sprit-sail Yard.

The cleat is placed with its fore side ⅓ the length of the bowsprit from the outer end; it is in length the diameter of the jib-boom, in thickness ⅓ its length.

It is formed with its fore and after sides to a vertical line, and its upper part is rounded, and of such a height that the jib-boom may lie upon the saddle clear of it. The cleat is fastened with two nails; and to prevent the slings from rubbing the upper part of the bowsprit, a piece of lead is nailed on the bowsprit under the cleat, to extend down about 2 inches below the middle line, and in breadth ½ the diameter of the bowsprit; and a piece of copper is likewise continued round the under side, to prevent the yard from injuring it.

To heel the Bowsprit, or form the Tenon.

The tenon of the heel of the bowsprit is up and down ⅗, and athwartships $\frac{1}{3}$ of the given diameter, and in length $1\frac{1}{2}$ inch more than the thickness of the partners. Sideways, the tenon is made to taper $\frac{3}{8}$ of an inch; but up and down to have the lower part on a level, and the upper part in the direction of the bowsprit. The sides and upper part form their shoulders against the partners, but the lower part is taken through in the direction of the tenon.

The Bowsprit Cap.

The bowsprit caps are twice the diameter of the jib-boom in breadth, and $\frac{5}{8}$ its diameter in thickness. The upper end of the cap fore-and-aft, is formed to the angle made by the stive of the bowsprit and a vertical line; or as the cap is placed vertically in the direction of the stive, below the upper end in the direction of the cap, its thickness is set down, and a line drawn through parallel to the upper end, which is the station and direction of the upper part of the hole for the jib-boom; below this line another is drawn parallel to it, and at a distance, set off perpendicular to the stive, equal to the diameter of the jib-boom, and $\frac{3}{8}$ of an inch for play; this will give the lower part of the hole for the jib-boom. These lines are drawn across the fore and after sides of the cap perpendicular to the edges, and will give the size of the hole up and down, in the direction of the cap; as the hole will be an ellipse, on account of the stive, the distance between these lines will therefore be the major diameter, while if two lines be drawn parallel to the edge, and equal to the diameter of the jib-boom, and $\frac{3}{8}$ of an inch for play, it will give the minor diameter; to these diameters an ellipse must be described for the hole (or $1\frac{1}{2}$ inch nearer the larboard than the starboard side, to allow more room for the jack stave). To obtain the square hole, a distance is set down in the direction of the cap, equal to $\frac{6}{16}$ of the diameter of the jib-boom, and to it a line is drawn across the aft side, perpendicular to the edge; this line will coincide with the upper side of the bowsprit, and give the upper part of the square hole on the aft side; a line is drawn to correspond with it upon the edge parallel to the lines before drawn; then on the fore part of the cap, $\frac{1}{16}$ of its thickness is set down perpendicular to the stive, for what the cap is to strengthen on; this will give the upper part of the square hole on the fore side. From the upper part on the fore side perpendicular to the stive, $\frac{5}{8}$ the diameter of the outer end of the bowsprit is set down, and a line drawn on the edge in the direction of the stive, to correspond with which, lines are drawn perpendicular to the edge for the fore and aft sides; these lines will give the lower part of the square hole on the fore and after parts of the cap. Below the lower part of the square hole, the thickness of the cap is set down in the direction of the cap for the lower end, which is formed parallel to the stive: the square hole is made athwartships on the aft side $\frac{1}{4}$ of an inch less than the diameter of the jib-boom, and on the fore side $\frac{1}{16}$ the thickness of the cap less than the aft side for strengthening on. This cap is now iron bound as the lower caps, and is in length five diameters, and in breadth two diameters of the jib-boom, and in thickness 1 inch less than the diameter of the jib-boom.

The bowsprit cap has six strengthening bolts driven through it and clenched; four of which are eye-bolts, with their eyes in the direction of the stive, two are placed in the middle between the upper part of the round hole and the upper end for the man ropes, and two between the round and square holes for the sprit-sail lifts, and foot rope. These eye-bolts are driven, one of the upper and one of the lower, from one side, and the other two from the opposite side; the remaining two bolts are placed in the middle, between the lower part of the square hole and lower end; the whole of these bolts are placed $\frac{1}{4}$ the thickness of the cap from the edges.

An eye-bolt is driven with its eye up and down in the middle line, at the lower end of the cap; it is brought through upon the upper side of the bowsprit, and forelocked just abaft the after edge of the foremost hoop. This bolt is for fastening the cap on, and for a guy for the sprit-sail-yard.

To trim the Tenon for the Cap.

The bowsprit cap shoulders on the two sides and lower part. The bevelling of the stive of the bowsprit to a vertical line, is first set off on each side to the thickness of the cap, or, at the upper part of the bowsprit from the outer end, this bevelling is got on one side, squared across from the middle line, and looked out of winding on the other; this being done, make a mould to fit the hole up and down, and apply it to the lines got on the side of the bowsprit, for the aft side of the cap, keeping its upper end well with the upper side of the bowsprit at the distance of these lines in the whole of what the bowsprit strengthens on, up and down, being taken off the upper part to resist the setting up of the main ropes. When the tenon is trimmed through the up and down way, and the thickness of the cap marked upon the sides, take the size, the athwartships way, by means of sticks, and apply them equally on each side of the middle, taking care to let the cap go on tight. The cap being well on and faying close to the shoulder, a cleat is nailed on the under side of the bowsprit against its fore side, letting the upper end of the cleat into the cap sufficiently to make its end square.

On the Furniture of Top-masts.—On the Hounds Pieces.

The hounds pieces are of elm, in length 1/18 of the given length, or ½ the given mast head, in breadth as much as the surface they are to fay upon, and in thickness so that the top-mast may pass through the cap. They have two square coaks raised in each, from 1 to 1⅛ inch; the lower one is placed with its lower end ½ the hounds down, where an abutment is left the whole breadth between the champhers, by the lower end of the lower coak being flush with the faying surface; the coaks are ⅓ the breadth of the hounds pieces; the upper one is 4½ inches down from the stops, and 6 inches in length; the space between the coaks, which is 3 inches, determines the length of the lower one. The outer sides of the hounds pieces are round, that they may have the greatest possible substance in the middle, and pass through the cap.

The hounds pieces are bolted with three bolts, two just above the upper coak, and one in the middle between the two coaks; from the middle down they are fastened with nails, 2 inches from the edge, and 3 inches apart; they are likewise placed round the end, which is rounded off.

On Heeling.

The heeling is brought on each side, and upon the fore part; upon the sides so as to fill up between the trestle-trees, and on the fore part, so as to fill up between the chock and the cross-tree, except ¼ inch play. The heeling is in length 3 diameters, and in breadth ⅗ of the diameter; but as the champher is in general brought into the size of the eight-square, at 3 diameters, commencing at 2½ diameters, the heeling must necessarily taper from 2½ diameters to the breadth of the eight-square at 3 diameters.

The heeling is likewise tapered flat ways from the middle of the length, to be about ½ an inch at the upper end, though this tapering commences commonly from the lower side of the fid hole. The heeling is fastened with nails.

On the Shives.

There is one shive, and the heel of the top-mast, at the lower part, forms the half dumb shive, which is on the opposite angle to the upper shive, with its upper part half the diameter of the top-mast, and the thickness of the shive above the hoop. But when there is a whole shive, the top-mast is left for a block once and a half the diameter of the top-mast below the lower part of the trestle-trees, which is in addition to the given length. This block is eight-squared with a hoop on the lower end, and has a shive hole on the larboard foreside eight-square, in length once the diameter of the top-mast, and ⅛. (See Table of thickness and diameter of Shive.)

The upper shive is placed on the opposite eight-square to the lower one, that is to pass through from the starboard foreside eight-square, to the larboard aftside, this would be for the fore top-mast; but it would be for the opposite eight-square for the main, for the ease of getting the two top-masts up together, and its lower part 3 diameters above the upper edge of the lower hoop, when no block or lower side of the trestle-trees, its length is once the diameter of the top-mast and ⅛. From the lower shive to about 3½ diameters, there is a groove taken out, rather larger than the top rope, for it to lead fair. There are two hoops in the heel of the top-mast, one ½ an inch below the lower part of the upper shive, and one with its lower part ½ an inch from the lower end of the top-mast, let on its thickness, for a champher to be taken off below the hoop.

On the Fid Hole.

The lower part of the fid hole is placed, once the depth of the trestle-trees above the upper part of the hoop and 1 inch, for an iron plate that is brought on the trestle-trees; it is up and down, if wood ½, and if iron ⅓ the given diameter of the top-mast, and its width ⅔ of what it is up and down. The fid hole is made up and down ¾ of an inch more than the proportion given, for an iron plate, which is fixed on the upper part, turning up on each side ½ the depth of the hole. This plate is nailed with two nails on each side.

On the Cheek Blocks.

The cheek blocks are placed on each side, upon the head of the top-mast, with their upper ends about 2 inches below the lower side of the cap; their length is once and a half the given diameter, breadth ⅘ the head of the top-mast, and thickness twice the thickness of the shive: when there are two shives in the block, ⅑ is left at each end beyond the shive, and ⅑ between the shives; when there is but one shive, which is in general the case, to the main-mast, the block is ⅜ shorter than the proportion given on each end. In the middle between the shives, a coak is raised ¾ of an inch, and let into the top-mast for a support for the block.

The blocks are fastened only by the two pins for the shives, which pass through them and are forelocked; these blocks are now seldom applied to top-masts.

Top-mast Cap. (Figs. 12 and 13, Plate III.)

The cap is the same in proportion to the top-gallant-mast as the lower caps are to the top-mast, and have their holes formed, and are let on the same. They have four eye-bolts, *y*, *y*, *y*, *y*, placed with their eyes athwartships, two about the after part, and two about the fore part of the round hole, and six strengthening bolts, two at each end and two in the middle, between the holes placed as described for the lower caps; these caps are now iron bound, and have the same proportion in relation to the top-gallant-masts, as the lower caps to the top-mast.

Size of Bolts in Caps.

	120						104					
	Strengthening Bolts.			Eye-bolts.			Strengthening Bolts.			Eye-bolts.		
	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.
	No.	in.	in.	No.	in.	in.	No.	in.	in.	No.	in.	in.
Main lower	8	44	1¼	4	18½	2¼	8	44¼	1¼	4	17	2⅛
Fore lower	8	44	1¼	4	18⅝	2¼	8	44¼	1¼	4	17	2⅛
Mizen low.	6	29	1	4	10⅜	1½	6	27½	1	4	11½	1½
Main top...	6	24¾	1	4	10	1⅜	6	23¼	1	4	9½	1⅜
Fore top....	6	22	1	4	9⅝	1⅜	6	21⅝	1	4	9⅝	1⅜
Mizen top..	6	16¾	⅞	4	7	1	6	16½	1	4	7	1⅜
Bowsprit....	2	32½	1¼	4	13¾	1¼	2	30½	1¼	4	12¾	1¼

	80 and 74						60 and 50.					
	Strengthening Bolts.			Eye-bolts.			Strengthening Bolts.			Eye-bolts.		
	Number.	Length.	Diameter.	Number.	Length.	Diameter	Number.	Length.	Diameter.	Number.	Length.	Diameter.
	No.	in.	in.	No.	in.	in.	No.	ins.	in.	No.	in.	in.
Main lower	8	41½ 38½	1⅜	4	17½ 16	2	6	34½	1⅛	4	14⅜	1⅞
Fore lower	8	41¼ 38½	1⅜	4	17½ 16	2	6	34½	1⅛	4	14⅜	1⅞
Mizen low.	6	28 26	1	4	11¾ 10⅞	1⅜	6	23½	1	4	10	1¼
Main top...	6	23 22	⅞	4	9½ 9⅛	1¼	6	20	⅞	4	8¼	1⅛
Fore top....	6	20 19¼	⅞	4	8⅜ 8	1¼	6	20	⅞	4	8¼	1⅛
Mizen top..	6	17 16	¾	4	7 6¾	1	6	14½	1	4	6	1
Bowsprit....	2	29 28¼	1⅜	4	12 11¾	1½	2	24½	1⅛	4	10¼	1⅛

	46 and 42.						28 and Large Sloop.					
	Strengthening Bolts.			Eye-bolts.			Strengthening Bolts.			Eye-bolts.		
	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.
	No	in.	in.	No.	in.	in.	No.	in.	in.	No.	in.	in.
Main lower	6	33 31½	1⅛	4	13½ 13⅛	1¾	6	25⅛	1	4	10⅜	1⅛
Fore lower	6	33 31½	1⅛	4	13½ 13⅛	1¼	6	25⅛	1	4	10⅜	1⅛
Mizen low.	6	23 22¼	⅞	4	9¾ 9½	1⅛	6	18	⅞	4	7½	1
Main top...	6	18¼ 17¾	⅞	4	7½ 7¼	1	6	14¼	⅞	4	6	⅞
Fore top....	6	16 15	⅞	4	6⅛ 6¼	1	6	13	⅞	4	5½	⅞
Mizen top..	6	13¾ 13⅛	¾	4	5⅞ 5¾	⅞	6	11	¾	4	4½	¾
Bowsprit....	2	24 22¾	1⅛	4	10 9¼	1⅛	2	18	1	4	7½	1

	Small Sloop and 18-gun Brig.						20-gun Brig.					
	Strengthening Bolts.			Eye-bolts.			Strengthening Bolts.			Eye-bolts.		
	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.	Number.	Length.	Diameter.
	No.	ins.	in.	No.	in.	in.	No.	in.	in.	No.	in.	in.
Main lower	6	24½	⅞	4	10	1⅛	6	20	⅞	4	8¼	1¼
Fore lower	6	24½	⅞	4	10	1⅛	6	20	⅞	4	8¼	1¼
Mizen low.	6	17	⅞	4	7	1	—	—	—	—	—	—
Main top...	6	14½	¾	4	6	⅞	6	12	¾	4	5	⅞
Fore top....	6	14½	¾	4	6	⅞	6	12	¾	4	5	⅞
Mizen top..	6	9¼	¾	4	3¾	¾	—	—	¾	—	—	⅞
Bowsprit....	2	16¼	⅞	4	6⅞	⅞	2	16	¾	4	6½	¾

The five after strengthening bolts to the lower caps of the new made-mast, will require to be about ⅛ the breadth of the cap longer, for what these caps are wider, in consequence of the breadth of the mast head. The lengths of the eye-bolts are given without the eyes.

On the Top-mast Cross-trees. (Fig. 16, Plate III.)

The top-mast cross-trees and trestle-trees are united together, and got into their position upon the top-mast, in a frame. This frame is in general composed of two trestle-trees, similar to those connected with the lower-mast; two or three long cross-trees, *b*, *b*; if only two, a short cross-tree is placed to form a frame round the top-mast; and one short cross-tree, with its after side the diameter of the top-gallant mast and heeling, before the fore side of the long cross-tree.

The trestle-trees are in length $\frac{2}{9}$ of the given length of the top-gallant mast; the cross-trees are twice the length of the trestle-trees, the after one is in general 1 foot longer than the foremost one. The trestle-trees are deep $\frac{5}{47}$ of their length, and wide $\frac{5}{9}$ of their depth; the cross-trees are wide once the width of the trestle-trees, and deep, at the middle, $\frac{8}{9}$ of their width, and at the ends, $\frac{1}{2}$ the depth of the middle; they are of a parallel depth at the middle to $\frac{1}{3}$ of their length. The trestle-trees are snaped from $\frac{1}{2}$ their depth, down to $\frac{1}{3}$ their depth from the end, and their ends rounded, the same as those to the lower-mast; and the cross-trees have their ends rounded to a semicircle, and a hole is bored about 3 inches in, for the top-gallant shrouds; though sometimes a score is taken out, and a small roll fitted in for the ease of unshipping them. The short cross-trees, when fixed, extend beyond the outside of the trestle-trees to a distance equal to the width of the trestle-trees, and have their ends rounded to a semicircle. The trestle-trees are kept apart $\frac{9}{14}$ the diameter of the top-mast, or the size of the top-mast athwartships, above the stops, and are placed so that the middle of their length, when fixed, may be well with the centre of the top-mast. The cross-trees are fixed to the trestle-trees, for the foremost, long, and middle cross-tree to be equally on each side of the centre, and to be apart $\frac{9}{13}$ the diameter of the top-mast, or the size of the top-mast, fore-and-aft above the stops. The foremost short cross-tree is placed with its after side the diameter of the top-gallant mast and the heeling, before the fore side of the foremost long; and the after cross-tree is placed at the same distance abaft the cross-tree that is fixed on the after side of the top-mast; that, should it be required, the top-gallant mast may be fixed on the after side as well as the fore side of the top-mast. The cross-trees are let down into the trestle-trees $\frac{2}{5}$ of their depth, and the score is taken $\frac{2}{3}$ out of the trestle-trees, and $\frac{1}{3}$ out of the cross-trees of what they let down. A facing is taken out of the trestle-trees from $\frac{3}{4}$ to 1 inch, to receive the cross-trees.

A chock is let up immediately under the cross-tree, to the one before, and to the one abaft the top-mast; it is in depth from the under side of the cross-trees to the lower part of the trestle-trees, and as wide as the cross-trees. These chocks are let into the trestle-trees from ¾ to 1 inch.

An iron plate is brought on the lower side of the trestle-trees and across the chocks between them, so as to circumscribe the hole for the top-mast. This plate has the part where it lies upon the trestle-trees of the same width as the trestle-trees; and where it lies upon the chock, it is of the same breadth as the chock. The cross-trees have one saucer-headed bolt in each trestle-tree, which is forelocked on the under side; the bolts which pass through the cross-tree, and which are placed on each side of the top-mast, are forelocked on the under side of the plate, and form its fastening.

A bolster is placed for the rigging upon the upper part of the cross-trees and trestle-trees; it extends from the fore part of the foremost to the after part of the aftermost cross-trees, which are placed on the fore and after sides of the top-mast; these bolsters are 1 inch wider than the trestle-trees, and their depth is $\frac{5}{7}$ of their width; they are fastened with two nails driven into the trestle-tree, considerably within the wood.

Dimensions of the Top-mast Cross-trees and Trestle-trees, according to the given length of the Top-gallant Masts, for the former Plan.

Given Length of the Top-gallant Mast. (*)	CROSS-TREES.							TRESTLE-TREES.				BOLTS.	
	Length of the Fore-most.		Length of the After.		Breadth.	Depth.	Short Cross-tree.	Length.		Breadth.	Depth.	Number	Diameter.
feet.	ft.	ins.	ft.	ins.	ins.	ins.		ft.	ins.	ins.	ins.	No.	ins.
37	16	5½	16	11½	6⅛	5⅝	To project once and a half the depth of the trestle-trees.	8	2¾	6⅛	11¼	8	⅞
36	16	0	16	6	6	5⅜		8	0	6	11	..	..
35	15	6½	16	0½	5⅞	5¼		7	9¼	5⅞	10⅝	..	..
34	15	1	15	7	5¾	5⅛		7	6½	5¾	10¼	..	..
33	14	7½	15	1½	5⅝	5		7	3¾	5⅝	10	..	..
32	14	2½	14	8½	5⅜	4⅞		7	1¼	5⅜	9¾	..	..
31	13	9	14	3	5¼	4¾		6	10½	5¼	9⅜	..	¾
30	13	4	13	10	5⅛	4½		6	8	5⅛	9	..	..
29	12	10½	13	4½	4⅞	4⅜		6	5¼	4⅞	8¾	..	..
28	12	5	12	11	4¾	4¼		6	2½	4¾	8½	..	..
27	12	0	12	6	4½	4		6	0	4½	8¼	..	..
26	11	6½	12	0½	4⅜	3⅞		5	9¼	4⅜	7⅞	..	..
25	11	1	11	7	4¼	3⅝		5	6½	4¼	7⅝	..	..
24	10	8	11	2	4	3½		5	4	4	7¼	..	..
23	10	2½	10	8½	3⅞	3⅜		5	7½	3⅞	7	..	⅝
22	9	9	10	3	3⅝	3⅛		4	10½	3⅝	6⅝	..	..
21	9	4	9	10	3½	3		4	8	3½	6⅜	..	..
20	8	10½	9	4½	3⅜	2⅞		4	5¼	3⅜	6	..	..
19	8	5	8	11	3⅛	2¾		4	2½	3⅛	5¾	..	..
18	8	0	8	6	3	2⅝		4	0	3	5½	..	..
17	7	6½	8	0½	2⅞	2½		3	9¼	2⅞	5⅛	..	½
16	7	1½	7	7½	2¾	2⅜		3	6½	2¾	4⅞	..	..
15	6	8	7	2	2⅝	2¼		3	4	2⅝	4½	..	..
14	6	2½	6	8½	2⅜	2⅛		3	1¼	2⅜	4¼	..	..
13	5	9	6	3	2¼	2		2	10½	2¼	3⅞	..	..
12	5	4	5	10	2	1⅞		2	8	2	3⅝	..	..

(*) $\frac{7}{87}$ of the hounded length, must be added to the hounded length, for the given length.

Top-mast cross-trees, fig. 15, when they are made with a circular piece, *c, c,* have this piece secured to the fore end of the trestle-trees, *a, a,* and to the outer part of the fore long cross-tree, *b.* The after cross-tree, *b,* is in length $\frac{5}{9}$ the length of the top-gallant mast to the stops. Trestle-trees, *a, a,* are in length $\frac{3}{7}$ of the fore cross-tree, and in depth 1 inch and $\frac{7}{8}$ to every foot of length, and wide $\frac{5}{9}$ their depth. The cross-trees are in breadth the same as the trestle-trees, and in depth $\frac{5}{6}$ of their breadth.

The fore top-mast trestle-trees to ships of 50 guns and upwards, have an additional length of 6 inches beyond the proportion given to them, and for smaller ships, 4 inches additional length, to allow a greater space, *p,* between the short cross-tree abaft the top-mast, and after long cross-tree, for a block for the main top-gallant stay.

The circular piece at the fore part abuts on the trestle-trees, and has a span piece, *k,* that unites the two pieces together with four up-and-down bolts. The short cross piece, *d,* lets down between the trestle-trees and bolts through the circular pieces with two fore-and-aft bolts. To unite the cross pieces and circular pieces, at the fore part, an iron strap is fixed to them, with its fore part clasping the circular piece, with a view that it may be easily unfixed. At the outer end of each cross-tree rollers are fixed, for the top-gallant shrouds.

On the Furniture of Top-gallant Masts.—On the Heeling.

The heeling is brought on the two sides and fore side, so as to conform to the space between the cross-trees and trestle-trees; and is the same to the top-gallant mast, as explained for the top-mast.

On the Fid Hole.

The lower part of the fid hole is 1 diameter, and 1 inch up from the lower end; it is up and down half the given diameter, and athwartships $\frac{2}{3}$ of what it is up and down.

On the Shive Holes.

There is one shive hole placed in the starboard foremost eight-square, with its lower part 3 diameters from the lower end, and its length, 1 diameter and $\frac{1}{6}$; and another shive is placed in a fore-and-aft direction, half the diameter below each of the stops: these shives are in length the diameter of the stops and $\frac{1}{6}$, and are coppered.

On the Furniture of Lower-yards.—On the Cleats. (Fig. 42, Plate III.)

One cleat is placed on the fore, and one on the after side of the yard-arm, $\frac{3}{72}$ the length of the yard in from the outer end. The sling cleats are placed on the fore side of the yard, one on each side, and at equal distances from the middle; they are $1\frac{1}{2}$ diameter of the mast apart. The yard-arm cleats are in length $\frac{5}{8}$ the diameter of the yard, and are fastened with two nails; instead of cleats, stops, *n*, *n*, are now commonly left on the yard-arm, as they are more secure and less injurious to the yard. The sling cleats are $1\frac{1}{2}$ diameter of the yard in length, and are fastened with one rag bolt and three nails. These cleats are square at the large end for the slings, from $\frac{1}{6}$ to $\frac{1}{7}$ of their length, and for the yard-arms, from $\frac{1}{8}$ to $\frac{1}{5}$. A cheek block, *a*, is likewise brought on the after side, well with the stops, *n*, for the top-sail sheet.

On the Battens.

Battens are placed on the after, upper, and lower sides, the same length as the squares, and on the fore side between the sling cleats. These battens are in thickness for yards $12\frac{1}{2}$ inches diameter and under, $1\frac{1}{2}$ inch; and for yards of greater diameter they are 2 inches in thickness; they are fastened with nails about 3 feet apart, on alternate edges, and have their ends rounded off and snaped.

On the Boom Irons. (Fig. 42, Plate III.)

Boom irons are placed on the main and fore yards, for the convenience of fixing the studding-sail booms; there are two on each side of the yard, the outer one is called the "yard-arm iron," *b*, *z*, and the inner one the "quarter iron," *d*. The outer one has two parts, the strap, *z*, which is let on lengthways upon the yard, and the crank, *b*, *h*, which projects at right-angles to the strap, with a ring, *h*, connected with it to receive the boom; in this ring is fixed a roll, *e*, for the ease of running the booms out. The quarter irons are placed at $\frac{3}{16}$ the length of the yard from the outer end; one part is formed as a clasp hoop to span the yard, *k*, *d*, *e*, and is set tight by two keys at *e*, with a joint at *k*; the shank or chock of this iron is connected with a ring, *f*, *g*, to receive the boom, but with a clasp, having a joint, *g*, and key, *f*, for fastening it, and for the convenience of topping the boom; this joint cuts the ring into two equal parts, and the centre of the joint and pin, or key, is in the same plane with the upper foremost eight-square, so that the boom may be prevented from rolling out with the motion of the ship, when the clasp is open, and at the same time the boom may be topped with the greatest ease. This iron, by being set up tight upon the yard, will answer for a hoop; but, as its station is fixed, it often becomes necessary to have a hoop very near it, to cover a knot.

The boom irons are placed so that a line passing through the middle of the shank of the outer, and chock of the inner, may pass through the angle formed by the foremost eight-square, and foremost upper eight-square, and the centre of any section of the yard; or, which is the same, a line drawn through the middle of their shanks, and cutting the centre of any section of the yard, will form an angle with the horizon of 22° 30′. The roll, *e*, in the section, is so placed in the ring of the outer iron that the pin or axis may lie horizontally. The yard-arm iron is fastened with two hoops, with one saucer-headed bolt driven through between them, and two nails in the ends.

Trusses to Lower-yards. (Figs. 31, 32, and 35, Plate III.)

Lower-yards to merchant ships have frequently iron trusses, for the ease of bracing the yards, *x*, up; *g*, is the hoop on the mast; *f*, the hoops on the yard; *c*, *c*, the universal joint; *e*, the screw for setting the hoop tight on the mast, and *b*, for fixing it to the yard.

On the Furniture of Top-sail Yards.—To Batten the Yard. (Fig. 41, Plate III.)

The foremost, after, upper, and lower eight-squares, have battens, *g*, *g*, *g*, the whole length of the squares placed on them; and have ekings, *r*, *r*, *r*, placed between them, and are hooped, *s*, *s*, *s*. These battens, when the yard is hooped at the middle, are of oak, and in thickness, to yards 12½ inches in diameter, 1½ inch; and to yards of greater diameter they are 2 inches in thickness. When they are not hooped, the battens are in general fir, and 1¼ inch thick: they are now generally hooped.

To Hoop the Yards.

When the top-sail yards are hooped at the middle, two are placed, *e*, *e*, once the diameter of the yard apart for the top-sail ties; four hoops are driven upon the battens, and upon the eking, which, with the battens, are made cylindrical; one of these is placed about 9 inches from each end of the battens, and two between these at equal distances. The yard-arms have as many hoops upon them as the arm formed from the top may require, on account of the knots; placing them, in general, upon every other rim of knots, or on those that are the worst collared.

On the Cleats.

The yard-arm cleats are placed, one on the fore side, and one on the after side of the yard; to the fore and main top-sail yards, $\frac{1}{12}$ the length of the yard from the outer end; and to the mizen top-sail, $\frac{5}{72}$ of the length; but it is now common, instead of having cleats, to have stops, *n*, formed out of the yard. The sling cleats are placed upon the batten, on the fore side, at an equal distance on each side of the middle, and apart once the diameter of the top-mast. The sling cleats are in length once the diameter and $\frac{1}{3}$, and the yard-arm $\frac{3}{4}$ the diameter. These yards have a cheek block, *a*, fixed on the after side, for the top-gallant sheet.

On the Boom Irons.

The fore and main top-sail yards have boom irons fixed on their yard-arms, *c, d,* with the outer arm or crank of the iron made to ship and unship; and when in its place, a line, passing through the middle of the crank, will pass through the centre of the yard, and the middle of the foremost upper eight-square, or make an angle with the horizon of 45°. The straps, *b*, will lie so that the pin for the shive will pass through them; they are fastened with two hoops and a bolt, the same as those to the lower-yards. The mizen top-sail yard has no boom iron, but a ferrule driven on, and an eye driven into the end of the yard.

On the Furniture of Cross-jack Yards.—To Batten the Yard.

This yard has only one batten on the after side, the whole length of the eight-square.

To Cleat the Yard.

The yard-arm cleats, or stops formed out of the yard,* are placed, one on the fore-and-aft side, at $\frac{1}{24}$ the length of the yard from the end; but when the yard is longer than the fore top-sail yard, they are placed $\frac{1}{24}$ within the fore top-sail yard. The sling cleats are placed on the fore side, at an equal distance from the middle line, and are the diameter of the yard apart. These yards have a ferrule at each end.

On the Furniture of Sprit-sail Yards.—To Cleat the Yard.

The yard-arm cleats are placed, one in the fore-and-aft side on each arm, at $\frac{1}{14}$ the length of the yard from the end. The sling cleats are at an equal distance on each side of the middle, and on the under side of the yard, and are $\frac{1}{3}$ of the diameter of the bowsprit apart.

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* Stops, instead of cleats, are now commonly formed out of the yards, in squaring for the upper and lower quarters; as *n*, fig. 41, Plate III., for top-sail yards.

On the Furniture of Top-gallant Yards.—To Cleat the Yards.

The yard-arm cleats, or stops formed out of the yard, are placed, one on the fore-and-aft side at each arm, at $\frac{1}{14}$ the length of the yard from the end; and the sling cleats are placed on the fore part, at an equal distance on each side of the middle, and are the diameter of the top-gallant mast apart.

On the Furniture of Royal Yards.—To Cleat the Yards.

These yards are cleated the same as the top-gallant yards.*

Dimensions of Hoops &c., on the Yards.

DESCRIPTION OF HOOPS, ETC.	Ships of the Line.				Frigates.		Ship's Sloops.		Brigs.			
	3-Deck.		2-Deck.						18 Guns.		10 Guns.	
	Wide.	Thick.	Wide.	Thick.	Wide.	Thick.	Wide.	Thick.	Wide.	Thick.	Wide.	Thick.
	ins.	ins.	ins.	in.	ins.	ins.	ins.	ins.	ins.	in.	ins	in.
Hoops on lower yds. yard-arm main and fore	4	⅜	3¾	⅜	3½	⅜	3¼	5/16	3	5/16	3	5/16
Hoops on lower yds. yard-arm mizen	3½	5/16	3¼	⅜	3	¼	3	¼	2¾	¼		
Hoops on lower yds. slings, main and fore	4	½	4	½	3¾	½	3¼	½				
Hoops on top-sl. yds. yard-arm main and fore	3½	¼	3½	¼	¾	¼	3	¼	3	¼	¾	¼
Hoops on top-sl. yds. slings, main and fore	3¾	½	3¾	½	3½	½	3	½				
Boom irons lower-yds. outer shank	3 round		2⅝		2⅜		2⅝		1⅞		1¾	
Boom irons lower-yds. outer strap	5	½	4¼	⅝	4	⅝	3¼	½	2¼	½	2¼	⅜
Boom irons lower-yds. outer ring	3¾	¾	3½	¾	3½	¾	2½	⅝	2¼	½	2	½
Bolts in strap diameter	⅞ round		⅞		¾		⅝		⅝		⅝	
Hoops on straps	2½	½	2½	½	2	⅜	1½	⅜	1½	⅜	2	¼
roller length	5¾		5		4¼		3½		3		2¾	
roller diameter	5		4½		4		2¾		2½		2¼	
Quarter irons clasp and ring	4½	¼	4	½	3¾	½	3½	½	2½	½	2	⅜
Boom irons on top-sail-yds. shank	2⅝		2		1⅞		1⅝		1⅜		1¼	
Boom irons on top-sail-yds. strap	4	⅜	3¾	⅜	3¼	⅜	2¾	3/16	2½	¼	2¼	¼
Boom irons on top-sail-yds. ring	2	½	2	½	1¾	½	1½	⅜	1½	¼	1¼	¼
Hoops on straps	2	3/16	2	3/16	1¾	3/16	1½	3/16	1¼	3/16	1¼	3/16
Ferrules on mizen top-sail yards	2½	¼	2½	¼	2	¼	1½	3/16	1½	3/16	1½	3/16
cross-jack	..	..	..	..	..	..	..	..	..	..	..	..
sprit-sail	..	..	..	..	..	..	..	..	..	..	..	..
top-gallant	2	3/16	2	3/16	1¾	3/16	1½	3/16	1¼	3/16	1¼	3/16
Eyes in ends of sprit-sail yards, diameter	1		1		⅞		¾		⅝		⅞	
of top-gallt. yds., diameter	⅞		⅞		¾		⅝		⅝		⅝	

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* The cleats to all the yards, except the lower yards, have nearly the same proportions for their length, and are square for the slings from ⅓ to ¼, and for the yard-arms from ¼ to ⅕.

On the Furniture of the Booms.—On the Jaws. (Fig. 36, Plate III.)

The jaws, *g*, *g*, *g*, are of oak or elm; they are in length from 4 to 5 feet from the fore end of the boom, and in depth, from ¾ to 1 inch less than the boom at the fore end. The boom is worked to a tongue at the fore end; when the jaws are in one, the tongue is 1½ inch; but when in two, it is ⅓ the diameter of the boom at the end. The tongue is formed, from 6 inches from the fore end of the jaws, so that an angle is made ⅝ of an inch in; from this place to the fore end, it is straight to the proportion given.

The jaws are formed to a semicircle, 1 inch larger than the diameter of the mast, for leather and play; at 6 inches from the fore end, they are left 1¼ inch; at the fore end, ⅝ of an inch, and at the foremost hoop, or at about 11 inches from the fore end of the boom, they are made 1½ inch larger than they are at the 6 inches from the fore end, for driving the hoops; from this place they are formed with an inflected curve, so as to follow and give sufficient strength to the hollow of the jaws; the fore ends are rounded each way, and the hollow is leathered, with the leather let in flush on the under side, so as to work on the saddle.

When the jaws are in one, they are left solid about 11 inches from the hollow, and are formed out to receive the tongue.

The jaws have in general four hoops, *e*, *e*, *e*, driven upon them, one over the butt of the tongue, if the jaws are in one, or 11 inches from the hollow, which commonly has a hole in it for the try-sail mast; one 7 inches from the fore end, and two at equal distances between. Under the third hoop from the fore end, a horizontal bolt is driven through the boom and both parts of the jaws, and one strengthening bolt is likewise driven about 2½ inches from the hollow. Under the two foremost hoops a nail is in general driven, on each side, through the jaws into the boom.

On the Blocks.

Cutters have in general two cheek blocks, fig. 37, A, on each side of the boom, for reefing; they are in depth about half the diameter, and in length three times their depth; they are placed so as best to answer for the reefs, the outer one is placed on the starboard side, about 3 feet from the outer end to the centre of the shive, *a*, with the hole, *x*; the next on the larboard side, about 2 feet 4 inches from centre to centre of the shives; the other two on alternate sides, about 2 feet from centre to centre of the shives; these blocks are let in as much as the boom rounds in their depth, and have their ends rounded. There is one eye-bolt driven through from the opposite side of each block, which passes through, and answers for the pin of the shive. The eye-bolts are sometimes left out, and have the holes, *x*, instead.

The booms of ships and brigs have, in general (though it is seldom used), one vertical shive, about 1⅓ inch within the necking, and one cheek block placed on each side for the topping lift. These blocks are in depth about half the diameter of the boom, and in length about three times the depth. The shive-hole is in general the depth of the block, and ⅓ in length.

Table showing the Size of the Ropes in circumference, that lead through the different Shives placed in the Masts, Yards, and Booms.

DESCRIPTION OF ROPES.	CIRCUMFERENCE OF ROPES.									
	Shives to be thick ⅛ more than the diameter of the rope.									
	120	104	80	74	60	46	42	28	18	10
Flying jib-boom, outer end, flying-jib outhaller	3	3	3	3	3	3	2½	2½	2½	2
Jib-boom, outer end, jib outhaller	4½	4½	4½	4½	4	4	4	3½	3½	3½
inner and heel rope	4½	4½	4½	4½	4	4	4	3½	3½	3½
In bees after end outer corner fore-top bowline	3½	3½	3½	3½	3	2½	2½	2½	2½	2
Top-gallant-mast, royal hallyard, fore and main	2½	2½	2½	2½	2½	2½	2	2	2	2
mizen	2	2	2	2	2	2	1½			
top-gallant hallyards, fore and main	4½	4½	4½	4½	4	4	3½	3	3	2½
mizen	3	3	3	3	3	2½	2½	2	—	—
rope, fore and main	4½	4½	4½	4½	4	4	3½	3	3	3
mizen	3½	3½	3½	3½	3½	3	3	2½	—	—
Top-mast cross-trees (fore), fore part, fore top-sail buntlines	3	3	3	3	3	2½	2½	2	2	2
after part middle shive, fore-top-gallant stay	4½	4½	4½	4½	4	4	3½	3½	3	3
remaining shives top-gallant and royal stay-sail downhalls	2	2	2	2	2	2	1½	1½	1½	1
(main), fore part, fore-top sail buntline	3½	3½	3½	3½	3½	3	3	2½	2½	2
Top-mast cheek blocks, fore, starboard-side, jib-stay	5	5	5	5	4½	4½	4½	3½	4	3½
hallyards	3	3	3	3	2½	2½	2½	2½	3	2½
larboard side, fore top-mast stay-sail hallyards	3½	3½	3½	3½	3	3	3	2½	2½	2
main top-mast stay-sail hallyards	3½	3½	3½	3½	3½	3	3	2½	—	—
head blocks, mizen top-sail tye	5	5	5	5	4	4	3½	3	—	—
heel blocks, main and fore top rope, pendants	9	9	9	9	8½	8	7	6½	6	5½
mizen	5½	5½	5½	5½	5	5	4½	4	—	—
Lower trestle-trees, after ends, truss falls	3	3	3	3	3	2½	2½	2	2	2
Top-sail-yards, outer end, reef pendants	3½	3½	3½	3½	3	3	2½	2	2½	2
Lower trestle-trees, truss-falls	2½	2½	2½	2½	2	2	2	2	—	—

Plate III., Fig. 30.

That the mast-maker may have the blocks and shives in their proper places, and of a proper size, it is desirable that he should be acquainted with the leading and size of the different ropes, for which purpose the following Table and rig is given.

Reference to Rigging, &c. (Fig. 30, Plate III.)

Sails.
- (1)—Course.
- (2)—Top-sail.

Rigging.
- *a.*—Clew garnetts.
- *b.*—Tack.
- *c.*—Sheet.
- *d.*—Buntlines.
- *e.e.*—Slablines.
- *f.f.*—Leechlines.
- *g.g.*—Bowline bridles.
- *h.*—Lower shrouds.
- *k.*—Top-mst. shrouds
- *l.*—Lower lifts.
- *m.*—Top-sl. clewlines

Sails.
- (3)—Top-gallant-sail.
- (4)—Royal.

Rigging.
- *n.*—Top-sail buntlines.
- *o.*—Top-gallant shrouds.
- *p.*—Top-gallant clewlines.
- *r.*—Reef tackle, also } leading through a sister block in
- *r.*—Top-sail lifts } top-mast rigging.
- *t.*—Royal clewlines.
- *v.*—Top-gallant lifts.
- *x.*—Reef points and cringles.
- *y.*—Futtock shrouds.
- *z.*—Iron necklace round the mast to secure the futtock shrouds.

On the Furniture of Gaffs.—On the Jaws. (Fig. 38, Plate III.)

The jaws, *g*, *g*, *g*, are formed and secured, in every way the same as to booms, except that the hollow is formed to an angle up and down, that it may be in the direction of the mast when the peak is hoisted; they are mostly formed to an angle of 45°, but the angle that is intended for the gaff to form with the mast, should determine it. They are always leathered in the hollow.

One eye-bolt is driven up and down from the upper side, in the direction of, and about 8 inches from, the fore end, for the throat hallyards, *z*, which is made to swivel, commonly called a "tumbler;" and one small eye-bolt on the lower side, for the down-hauler. At the end of the gaff there is frequently placed an iron, *a*, for displaying signals, with a shive, *b*, in the end. There are likewise hoops with eyes, *c*, *c*, driven on the gaff for the peak hallyards.

Ships and brigs have a shive-hole, up and down a diameter from the outer end, and a ferrule and eye, with the eye up and down, when the iron is not brought on for displaying signals.

On the Mast, Derrick, &c. of Sheer Hulks.

Mast hounded length 111 ft., headed 20 ft. 6 ins., diameter, 40 inches.

Sheers length 143 ft. 6 ins., and diameter 28 and 31 ins. at the scarph.

Derrick length 143 ft. 4 ins., and diameter 24 and 26½ ins. at the scarph.

Shores length 85 feet 3 inches, and diameter 19½ at the upper end.

Sheers quartered ⅓ from the lower end, upper end ⅔ the given diameter, and lower end ¾.

Derrick quartered from the middle, upper and lower ends ⅔ the given diameter.

Scarphs of sheers and derricks, 36 feet long.

Chock on the side of the mast, to form an abutment on the trestle-tree 11 feet long, wide at lower end 15½ inches, at the upper end 14½ inches, thick at the lower end 9 inches, at the upper end 4½ inches.

Trestle-trees long 10 ft. 7 ins., broad 11 ins., and deep 13½ ins.

ON THE

DEFECTS OF MASTS, ETC.

Masts are defective either by decay, or by being sprung or wrung; these latter defects are, when the elastic force is in part or wholly overcome by fracture, or by having forces acting on them beyond what the tenacity of the fibre is able to resist.

Decay has been found by experience to be the most frequent defect; it is most common in two-deck and three-deck ships, especially in three-deck ships, the masts being stronger in proportion to the stress they are subject to, and receiving better support; in consequence of which, they are less subject to be sprung, and, therefore, are not so frequently removed, till, by their age, from the bad quality of the materials, or the manner in which the different parts are combined, they become decayed.

The parts most subject to decay are, the heel, partners, and cap, those between the cheeks and spindle, or at the edges of the cheeks, and under the rigging, and at the head; but the most frequent decay is at the partners and cap; of bowsprits, at the cap under the gammoning, and at the bed.

Fractures take place, or the mast becomes sprung, in made-masts, most commonly at the partners, the tail of the cheek, between the deck and tail of the cheek, and at the hounds; *single-tree masts*, at the partners and hounds; cutters'-masts at the partners, or upper part of the wedges, at the hounds, and just below, and sometimes in the wake of the jaws of the boom: it is not uncommon for masts to be found sprung at the head, but the most frequent defect, from frigates downwards, is that of the mast being wrung at the head.

Bowsprits are found sprung principally at the gammoning bed, between the gammoning and cap, at the upper and lower parts, but mostly at the upper part, and between the gammoning and bed, more frequently at the sides; they are sometimes found wrung at the cap. Top-masts are found sprung most frequently at the cap and hounds; yards at the slings, but they are very often found defective by the shans, produced from the exterior of the yard, crossing the range of fibre.

Springs are discovered by shans and fractures, and sometimes by the fibre suffering by compression, while the continuity of the fibre is not wholly overcome;* shans are commonly occasioned through the defect of the materials, generally from badly collared knots, and from the range of fibre not being in a direct line with the masts, &c. Fractures are the effect of the age of the mast, or of too powerful stresses acting on them; they are discovered generally in two forms, one with a black waved and jagged line across the mast &c.; the other forming between shakes or longitudinal openings, short fractures, that rise one above the other in the form of steps; this is commonly called "Jacob's ladder." This fracture in general takes place in single-tree masts, and top-masts; it is a defect that seldom admits of repair.

When fractures appear without any known cause, as the uneasy motion of the ship, or having had to sustain any violent impulses, it may be considered as the effect of the internal weakness of the mast; and when the mast *complains*, or gives signs of weakness, without any external appearance of decay or fracture &c., it may be considered as arising from the same cause, and most probably it is sprung or decayed internally, especially if the mast has been in service more than five years.

When any part of a mast, &c., suffers by compression, or buckles, or what is technically called *having the grain upset*, and the fibre in different parts takes a sinuous form, it is a proof of considerable weakness, and that it must, if a made-mast, have worked considerably; though this defect is most common to masts of small vessels, that have a great rake.

To discover the defects of masts and their extent, if for decay, the mast, &c., is commonly bored with a very small auger, at distances about 3 feet apart, or at the lower edge of each hoop, into the centre, boring alternately athwartships, and fore-and-aft, and the chocks or ekings under the clasp hoops are taken out to search in the place of the wedges at the different decks, and at the edges of the cheeks, both on the fore and after fishes and side-trees. When fractures are discovered, to ascertain their extent, it is common to take off shavings deeply, with a plane first, and if the black mark of the fracture still appear, to take a sharp chisel, and to penetrate by taking off small portions at a time, till the defect begins to disappear; then the depth of the incision will determine whether the mast, yard, &c., or part of the mast where it takes place, ought to be condemned; if a Jacob's ladder, a narrow chisel is made to pass between the shakes. To discover with the greatest certainty the defects of a mast, when it appears weak, without any visible defect, it is common to take off the cheeks, to drive the body hoops off, and to take out the aris pieces, to give an opportunity of examining the edges of the fore and after fishes, and side-trees; and all masts, yards, &c., when properly examined, have the paint or other substances taken off their surfaces, and planed all over, so that the smallest defect shall be shown.

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* This compression of the fibre is frequently discovered in new sticks or trees.

When the nature of the defect is such as to require that the mast &c., should only be strengthened, if a made-mast, a fish is applied, similar to the front fish; but if a single-tree mast, it is strengthened by what is called a "flat sole fish," that is, by taking the round off the mast, on the side of the defect, to form a seating with two other seatings, about half as wide as the first, at its intersection with the circumference; upon these three seatings, a fish and two ekings are brought, and hooped as the front fish. These fishes should run through the wedging deck, so as to have a hoop below.

Bowsprits may be fished as masts, if they be not too far gone; if a single-tree, by a flat sole fish, and if made by a fish similar to the front fish; these fishes always run through the bed to receive a hoop within.

To Fish a Main-yard when sprung.

The manner in which main-yards are frequently sprung or fractured, makes it impossible to give a method to remedy every defect. However, whenever a scarph can be worked to about $\frac{1}{4}$ or $\frac{1}{5}$ the length of the yard, and a thin fish brought over it to extend several feet each way beyond the scarph, and properly hooped, the yard may be made equally strong with a new yard; and when it is sprung on the outer surface, it may frequently be made good without danger, when the fracture is not deeper than $\frac{1}{9}$ or $\frac{1}{10}$ of the diameter of the yard; by making a seating about 5 or 6 feet each way, so as to take the fracture out, and by forming the tablings out of the round of the mast. In working a piece into the part taken out, it should be 1 inch thicker than the depth of the fracture, with its ends hollowed out to lay over the round of the yard, and should extend a foot or 18 inches beyond the seating. To give additional strength, instead of hooping the pieces brought on, a thin fish should be worked over it, extending 3 or 4 feet each way, beyond the ends of the pieces, and hooped. One hoop should be placed about 6 inches from each end of the fish, one over the ends of the pieces worked in, and two or three between them, working ekings against the edge of the fish, so as to form the outer part of the fish and yard with a fair curve.

To Make a temporary Main-yard.

When a main-yard is entirely carried away at sea, it is not uncommon to make a temporary yard from the spare spars supplied to the ship. This is frequently done by bringing the two top studding-sail-booms end to end, which together make up the length of the yard; then to scarph them, by bringing the spare top-sail and top-gallant yard in the middle, and other small spars, as top-gallant studding-booms &c., to make up the form of the yard; and when the different spars are so placed as to over-run each other in the best possible way, they are then well woolded together, and a yard is formed that will be found to answer every purpose as a temporary supply. The rolling of the ship makes it frequently difficult to keep the spars together, till woolded, in which case it is better to lay any inferior pieces on the deck, as skids, and to fix the lower ends of some capstan-bars into them, with their upper ends guyed to the sides of the ship; by this means the different spars may be kept sufficiently steady to be woolded in a proper manner. To whatever part the wooldings are applied, it is necessary to fit chocks between the spars, so as to keep them firm, and for the woolding to lay fair over them, that the spars may not be wounded.

A DESCRIPTION

OF THE

DIFFERENT KINDS OF SHIPS AND VESSELS.

Advice Boat.—A vessel of a light build, and fast sailing, employed in carrying expresses or orders with all possible despatch.

The *Balanza of Sicily* has the fore and mizen masts rigged as xebecs, with a triangular sail from the end of the bowsprit to the head of the fore-mast.

Barca-longa.—A vessel common to the Mediterranean, as the large Spanish fishing-boat, carrying two or three masts with lug-sails.

Barge.—A vessel or boat of state, also boats from 32 to 35 in length, supplied to ships of war, principally for the use of flag-officers and captains.

Bark.—A general name given to vessels with three masts, with the mizen-mast and a pole-mast above, instead of a regular top-mast and top-gallant-mast; and if with a square top-sail, it is commonly set flying; but instead of this sail, it is more general to have a gaff top-sail. Vessels likewise used in the Mediterranean, with a fore-mast as a xebec, and main and mizen pole-masts as a polacre.

Bean-cod.—A vessel common to the coasts and rivers of Portugal, used in general as fishing or pilot-boats, and are rigged with one mast and large latteen sail, which extends the whole length of the deck. They have a curved stem falling aft, with its fore part plated with iron, to resist the stroke of any vessel falling athwart hawse, and they are very sharp forward.

Bilander.—A name given in different parts of Europe to different kinds of vessels, but more commonly distinguished from a brig, by the form of the fore-and-aft main-sail, which is a sort of trapezium in form, and bent to a yard similar to a spanker formerly used by ships, with the tack carried forward nearly to the middle of the ship, and carried down to a ring bolt, and the sheet to the taffrail. The yard is commonly very much peaked, in general to an angle of about 45°. Few vessels now use this mode of rigging; when used, it is in general applied to merchant ships, and then more commonly in the Dutch service.

Bombardar.—A vessel in the Mediterranean, carrying a main-mast as the polacre, and a mizen-mast as the English yawl. The main-mast is $\frac{1}{8}$ of the length before the middle; and the mizen-mast is $\frac{2}{28}$ abaft the middle. She is not unlike the English ketch, except that the main-mast is rigged as a polacre. The main-mast is upright; and the mizen-mast has a small rake. She has two sails, similar to the English jib, and fore top-mast stay-sail.

Brig.—A vessel having two masts, rigged similarly to the fore and main masts of ships, and fore-and-aft main-sail. This term, or brigantine, is often applied by seamen of different nations, to vessels peculiar to their own marine, and not so much confined to the marine in which they are masted and rigged, as in the British service. (See Brig, page 82.)

Buss.—A vessel used in the herring fisheries, but most commonly by the Dutch; they have two and sometimes three short masts in one piece, carrying a square-sail on each, with sometimes a top-sail above the main-sail, and, occasionally, in fine weather, they rig a jib to a spar they run out forward, and sometimes they add a sort of studding-sail and driver to the lower-sails. The main and fore masts of these vessels strike when they shoot their nets; they are fixed by large hinges in a trunk at their lower ends, and lay in crutches aft when down.

Bugalet.—A small vessel used on the coast of Brittany, having two masts with the fore-mast very short, carrying on each a square-sail, with a top-sail sometimes on the main-mast. They have a bowsprit, and set one or more jibs.

The *Buggerow.*—A trading vessel of the western coast of Hindostan, has one latteen-sail brought to the stem. It has a raised deck abaft; and is steered similarly to the Dutch dogger.

Catamaran, or Balsas.—A floating raft used by the Indians and Spaniards in South America, it is mostly made (the largest) with nine trunks of the balsa, a very light wood, lashed together: they are from 70 to 80 feet in length, and from 20 to 24 feet wide, except the middle one, which projects considerably aft; it has one mast in the form of shears, to which is hoisted a large square-sail, and one forward for a fore stay-sail when it goes to windward. These rafts are steered very nicely by means of several planks about 10 feet long, and 15 or 18 inches wide, placed vertically in the spaces between the trunks, which are moved up and down at one or other ends of the raft, according to the direction in which it is to go, or to make it luff or keep from the wind, &c.

Cat.—A vessel common to the northern nations of Europe, but mostly of a Norwegian build, with narrow stern, projecting quarters, and deep waist. They are commonly rigged as an English ship, excepting having only a pole-mast above the lower, and no top-gallant-sails, but with a gaff to the mizen-mast. They are used sometimes in the English coal trade.

Caracores.—A vessel used by the natives of Borneo and islands adjacent, and sometimes by the Dutch, as *guard à costas*, in those latitudes. They are very light vessels, high at each end, navigated chiefly by paddles, used on narrow platforms, made of reeds, both within and without board, on which those who paddle sit. The platforms are supported by bars lying across, one of which, by the outer end on each side projecting, serves as a balance to prevent the vessel being upset. They have frequently three or four ranks of rowers, some within and some without board, on the platform, so that they can produce considerable velocity. When they use sails, the mast is formed of like triple sheers of bamboo, but supported by shrouds, and has an oblong sail, in general hoisted on a bamboo yard with a boom at foot; the sail is kept to windward by a bow-line; the yard has a brace, or vang, that leads aft, and the sail is hauled aft by a sheet.

Champans.—Vessels used by the Chinese and Japanese; they are small and flat-bottomed, having one mast, supported by three shrouds on each side, which are sometimes all carried to windward. To this mast is attached a single sail, made of cane. These vessels seldom exceed 80 tons, and are mostly constructed without iron or nails, and are considered extremely weak and unfit for a rough sea.

Chasse Marée.—A French fishing boat, commonly rigged with two masts and lug sails. (See Lugger, page 61.)

Cutter.—(See page 66.)

Cutters.—Boats supplied to ships of war. They are in general clencher-built, that they may be as light as possible; they vary from 32 to 16 feet in length, and are used for various purposes that are common to ships' duty, though sometimes 32-feet cutters are supplied instead of barges; the shorter boats of this description are commonly called and used as jolly-boats.

Dogger.—A fishing vessel used by the Dutch, commonly in the German Sea and the Dogger Bank. They have in general a main and mizen-mast, somewhat resembling a ketch; on the main-mast are in general set two square sails, and on the mizen a gaff-sail; they have a bowsprit, with sprit-sails and two or three jibs.

Dow Arab, Dow Ceylon.—The dow Arab is a vessel with one latteen-sail, extending the whole length. The dow Ceylon has one square lug and a jib.

Dinga, or Bombay Bark.—Vessels used at Bombay and places near; they have commonly one mast, a third of their length from the stem, which rakes considerably forward; they have one sail, resembling a settee sail, bent on a long yard, with the tack carried to the stem, and sheet to the heel of the mast. These vessels commonly wear instead of tacking, to do which they peak the yard against the mast, and pass the sheet before, at the same time shift the sail. They are sometimes navigated by oars, or paddles.

Fly-Boat, or Flight.—A large Dutch vessel, flat-bottomed, with its stem remarkably high, and with broad buttocks.

Felucca.—A small vessel used in the Mediterranean, that seldom goes out of sight of land; they are commonly rigged and navigated similar to galleys.

Galley.—A low flat vessel, with one deck, navigated with sails and oars; they are common to the Mediterranean; they have two masts, similar to the xebec, but more upright, while the yards and sails are the same; the masts are commonly supported, the main by ten, and the fore by five pair of shrouds, with the laniards reeved through double blocks, for setting up; they commonly carry large sails for fine, and small sails for foul weather; and, when the wind is right aft, a square sail, called a cross-jack, is set on the fore-mast. The Venetians' galleys are the largest, and similar to the xebec, with three masts, and propelled with 32 banks, or 64 oars. These vessels are commonly 162 feet long, and 32 feet wide. The half-galleys have but two masts, struck at pleasure, with latteen-sails, and 25 banks of oars; they run from 120 to 130 feet long, and about 18 feet broad.

Bombay Galley.—A vessel mostly used by corsairs on the coast of Barbary; they are smaller, but similar to the common galleys.

Galleys.—Boats, clencher-built, from 28 to 36 feet in length, used most commonly by revenue cruisers, against illegal trade, and in enterprises and expeditions against the enemy.

Gigs.—Boats, clencher-built, from 16 to 27 feet in length; they are for swift rowing, and are supplied to ships when light boats are required.

Gondola.—A barge navigated on the canals of Venice; also as passage boats of six or eight oars in other parts of the coast of Italy; those used on the canals of Venice are frequently curiously ornamented.

Galliot.—A Dutch vessel, with one mast, very far aft, and a bowsprit; the mast is commonly supported by five pair of shrouds, with one stay setting up to the stem and one to the bowsprit end; abaft the mast is a gaff, or sprit-sail, and commonly a square top-sail set flying; to the stay a stay-sail is set, and to the bowsprit one or two jibs; sometimes, quite aft, a small mizen-mast is stepped, on which is set a gaff, or sprit-sail, hauled out to a boom.

Hawker.—A vessel used by the Dutch, navigated by a main and mizen mast.

Houarios.—Vessels used as pleasure-boats in inlets and rivers in the Mediterranean; they have commonly two masts, with sliding top-masts, with latteen sails, with the lower part of the sail bent to hoops that encircle the standing masts; they have a bowsprit, upon which is spread a jib, which assists in the vessel's going about.

Junk.—A vessel used by the Chinese, of a flat bottom, being, in size, from 100 to 500 tons burthen; they are commonly rigged with three masts, and a short bowsprit placed on the starboard bow; on the fore and main masts is hoisted a kind of lug-sail, made of cane or bamboo, which is confined by iron travellers that fix to the bamboos at several divisions on the sail; these sails are kept to the wind by two ropes fixed to the foot of the sail, and leading to the mast head, while the lee part of the sail is hauled aft by spars that are made fast to each fold of the sail; the mizen-mast has a gaff-sail, made of cotton. They carry likewise a main top-sail, sprit-sail, and jib, made of the same materials.

Ketches.—Vessels with two masts, a main and mizen mast; the main-mast, which is commonly placed near the middle of the vessel, is similar to that of a ship; the mizen commonly carries a square top-sail and gaff-sail; the bowsprit is rigged similar to that of a ship, and carries several jibs and stay-sails. This rig was formerly applied to bomb-vessels, for the convenience of firing the mortar, and to yachts; but it is a rig that is now seldom applied but to small vessels. (See page 80.)

Koffs.—Dutch vessels of burthen; they carry two masts, with large sprit-sails, with a square top-sail set flying; on each of the poles of the masts they have a bowsprit, to which they carry a jib or two, and are considered, with their lee boards, to sail very close to the wind.

Launch.—A boat used for watering and carrying stores to and from ships of war; they vary in length from 34 to 39 feet. These boats are sometimes armed and equipped for cruising at short distances, and are, therefore, mostly fitted to carry one twelve-pounder carronade, and were sometimes fitted with swivel stocks.

Lugger.—(See page 59.)

The *Mulet* is a vessel with three latteen-sails: it is used upon the coast of Portugal.

Pinnaces.—Boats supplied to ships for similar purposes as barges, but to carry officers of less rank; they are not commonly fitted up in the same style, as they are lined and panelled no further forward than the stern sheets: they are in general from 28 to 32 feet in length.

Pinks are vessels used in the Mediterranean for burthen; they differ from the xebec by being much higher out of water, and are much fuller in the bottom; they have three masts, carrying latteen-sails, and have long narrow sterns. English vessels, of this form aft, are said to be pinked-sterned.

Polacre.—A merchant vessel, navigated in the Levant and other parts of the Mediterranean; they have three pole-masts, and a bowsprit of one piece: the masts were formerly without tops, caps, or cross-trees; but they have now frequently a fidded top-gallant mast; they carry the same sails as ships, and have square yards, all of which, except the lower, are without horses, as they loose and furl the top-sails and top-gallant-sails by standing on the yard below.

Polacre Settee.—Vessels in general rigged with square-sails on the main and mizen masts, as the polacre, but latteen, as the xebec, on the fore, though sometimes the mizen is rigged with a latteen sail.

Pardos.—A vessel used in the Chinese Seas: they are not so large as the junk; they are used both for trade and war; their sails are laced slackly to one side of the mast, instead of being bent to a yard.

The *Scampavia* of the Mediterranean has a polacre main-mast, and latteen fore and mizen masts, similar to the xebec. She has a raking prow, a short outrigger, and a triangular sail.

Schooner.—(See page 66.)

The *Schooner of Ballahoe* has pole-masts and short gaffs, and a fore stay-sail brought to the end of the bumpkin

Settee.—Vessels navigated in the Mediterranean; they are rigged similarly to the xebecs, or galleys, with two masts, only using settee sails instead of latteen.

Shallop.—Shore vessels, used in France, and in Holland and Flanders; are commonly decked, and carry one mast, carrying a gaff main-sail and a bowsprit, on which is set, frequently, two or three jibs, and often a small mast is fixed abaft, to which is affixed a small mizen; in addition to these sails they carry, sometimes, on the fore side of the mast, a sail that is fixed to a small spar, projecting forward, the tack of which is brought to the stem, and the sheet to the shrouds. There are large boats rigged similar to schooners that are likewise called shallops.

Ship.—(See page 89.)

Snow.—A large brig, with a try-sail-mast abaft the main-mast, for the gaff to the fore-and-aft main-sail to work on.

Tartan.—A small vessel navigated along the coasts of the Mediterranean, having one mast and bowsprit; to the mast is attached a large latteen sail, and to the bowsprit a large jib; and when the wind is aft they have a square-sail, similar to a cross-jack, that they hoist instead of the latteen.

Austrian Trabacalo is similar to an English schooner, only that the masts are very nearly upright. The fore-mast is about $\frac{1}{3}$ the length before the middle, and the main-mast $\frac{1}{3}$ abaft the middle. The main-sail and fore-sail are lugs, with the tacks brought to the mast. She has a fore top-sail and top-gallant-sail, and a fore-mast stay-sail and jib. The fore mast is quite upright; and the main-mast rakes a very little aft.

Xebec.—(See page 59.)

Yawls.—Boats for conveying light stores, provisions, and passengers, to and from ships of war; they are, in length, from 16 to 26 feet, and, to the smaller class of vessels, they answer all the purposes of a launch.

Dimensions of Masts and Yards of English and French Ships: French Ships as published in 1818, *and reduced to English Measure.*

	THREE-DECK SHIPS.						TWO-DECK SHIPS.												FRIGATES.					
	English.			French.			English.			French.			English.			French.			English.			French.		
	Length.		Diam.	Length.		Diam.	Length.		Diam.	Length.		Diam.	Length.		Diam.	Length.		Diam.	Length.		Diam.	Length.		Diam.
	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.	feet.	ins.	ins.
Length on the lower deck	205	0		206	6		193	10		191	8		176	0		179	11		151	5		151	2	
Breadth extreme	54	6		59	6		51	5		50	0		47	6		47	0		40	1		38	4	
Main-mast hounded	106	7	41	109	8	41½	101	7	39¼	105	5	38¾	93	0	36	95	8	36⅜	77	6	28	81	2	29¼
Main-mast headed	20	7		18	1		19	8		17	0		18	0		15	11		15	0		13	1	
Main top-mast hounded	64	11	22	68	5	23⅝	59	8	20¾	65	5	21¾	56	2	19¼	60	2	20¼	46	10	16⅝	52	10	17½
Main top-mast headed	10	1		9	4		9	7		9	0		9	1		9	0		7	6		7	11	
Main top-gallant mast hound.	33	0	12⅝	35	2	12¾	30	5	11½	34	2	11¾	29	0½	11	33	0	11¼	23	8	9	30	11	10⅝
Main top-gallant mast pole	23	0		19	2		21	6		18	1		21	0		13	0		19	0		17	0	
Fore-mast hounded	98	11	38	102	2	39⅜	92	6	37	95	11	36¾	84	9	31¼	88	5	36½	71	1	25	72	1	26½
Fore-mast headed	19	1		17	0		18	6		15	11		16	6		14	11		13	9		12	1	
Fore top-mast hounded	52	2	22	62	10	23⅝	53	10	20¾	59	11	21¾	50	0	19¼	57	11	20¼	41	6	16⅝	48	1	17½
Fore top-mast headed	9	2		8	6		8	8		8	2		8	0		7	0		6	8		7	2	
Fore top-gallant mast hound.	30	1	11	30	11	11¼	26	4	10	29	10	10⅝	25	3½	9⅝	29	10	11⅛	20	5	7¾	27	8	10⅛
Fore top-gallant mast pole	21	0		17	0		20	0		15	11		19	6		10	7		17	6		14	11	
Mizen-mast hounded	73	4	25	76	7	27⅞	71	2	25⅛	67	11	24⅛	64	7½	21⅛	66	7	23⅜	57	0	19	57	6	19⅜
Mizen-mast headed	12	9		11	8		12	10		10	7		11	4		11	1		9	11		9	6	
Mizen top-mast hounded	46	6	14⅓	48	0	14⅝	43	9	14	46	5	13¾	41	4	13	45	10	13¾	35	6¾	11⅞	38	5	12¾
Mizen top-mast headed	7	4		6	4		7	0		5	11		6	8		5	4		5	8⅜		6	4	
Mizen top-gallant mast hound.	22	0	8⅛	27	11	9¾	21	7	8½	29	10	7⅞	21	0½	8	29	7	7⅜	17	11½	6⅞	21	4	7⅜
Mizen top-gallant mast pole	15	0		14	11		17	6		10	7		17	0		9	6		15	6		10	7	
Main-yard	109	3	26	117	0	27⅝	103	3	21¼	106	6	26⅛	96	8	22⅝	97	11	27¼	81	9	18⅞	85	2	20¾
Fore-yard	95		22⅜	106	6	25½	89	9	21½	96	9	24⅜	84	8	19⅜	89	5	24⅛	71	5	16⅜	74	6	17⅕
Cross-jack yard	78	8	16⅞	92		19⅓	74	3	16	96	9	18⅝	70	6	14⅝	89	5	15⅞	59	0	12¼	58	6	12⅜
Main top-sail yard	78	8	16⅞	82	4	17	74	3	16	79	10	17	70	6	14⅝	74	6	15⅜	59	0	12¼	61	9	12½
Fore top-sail yard	69		14⅜	78	6	17	64	8	13⅞	62	11	15⅞	61	6	12¼	66	0	14⅞	53	4	11½	54	4	11¼
Mizen top-sail yard	52	6	11	60	8	13⅞	49	0	10⅜	55	4	9½	46	1	19⅝	66	0	13¼	40	8	8¾	47	11	8¼
Main top-gallant yard	51	10	10½	54	4	10⅝	46	0	9⅜	50	0	8½	45	10	9¼	47	9	7¼	37	6	7½	40	5	7⅜
Fore top-gallant yard	46	3	9½	48	11	9	38	10	8	44	8	7⅞	40	0	8½	42	7	7⅜	32	11	6½	35	4	6⅜
Mizen top-gallant yard	36	3	7½	42	7	8½	34	0	7	38	4	6⅝	32	0	6⅜	36	6	6¼	28	0	5½	30	10	6⅞
Bowsprit	75	1	37	74	6	40½	71	11	36	69	2	37¼	61	6	12¼	66	0	24⅛	53	4	11½	55	4	27¾
Sprit-sail yard	69		14⅜	72	5	16½	64	8	13⅞	71	4	16½	61	6	12¼	64	11	14⅞	53	4	11½	58	6	11¾
Driver-boom	74	4	14⅜				70	2	13⅞	48	11	6⅜	66	0	12¼	47	11	5¼	55	8	11			
Gaff	55	9	12⅕				43	0	7¼				50	2	11⅞				42	5	10			
Jib-boom	46	3	9¼	63	11	17	50	0	14½	56	5	13¼	40	0	8½	53	2	13¼				58	6	12¾

ERRATA.

PAGE 177, line 10, for *rough*, read *frough*.
,, 203, line 4 from the bottom, for "correct relation to their respective masts and yards," read, "correct relation to *the lengths of* their respective masts and yards."
,, 11, line 16, for *fore part of the stern*, read *fore part of the stem*.
,, 32, line 15, for *boat*, read *boom*.
,, 211, top line, for *Fig.* 28, read *Fig.* 17.
,, 212, 12th line from the bottom, read, *a second hound hoop, h, h. fig.* 8, *plate* III., *is driven on.*
,, 242, top line, for *plate* IV., read *plate* III.
,, 243, 17th line from the top, for *figs.* 27 *and* 28, read *figs.* 28 *and* 29.
,, ,, 18th line from the top, for *fig.* 28, read *fig.* 29.
,, 251, 11th line from the top, for *fig.* 40, read *fig.* 44.
,, ,, 23rd line from the top, for *fig* 29, read *fig.* 2.
,, 277, 13th line from the top, for *figs.* 31, 32, *and* 35, read *figs.* 31, 32, *and* 33.
Pages 185 to 193, in the headings of the Tables, for *plate* III., read *plate* IV.

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